



## Workshop Manual Fox 2004 ➤

### 3 - Cyl. injection engine (1.2 l)

Engine ID	BMD	CHF	CHF B	CHF A					
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Edition 09.2019



## List of Workshop Manual Repair Groups

### Repair Group

- 00 - Technical data
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- 13 - Crankshaft group
- 15 - Cylinder head, valve gear
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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.



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## 00 – Technical data

### 1 Technical data

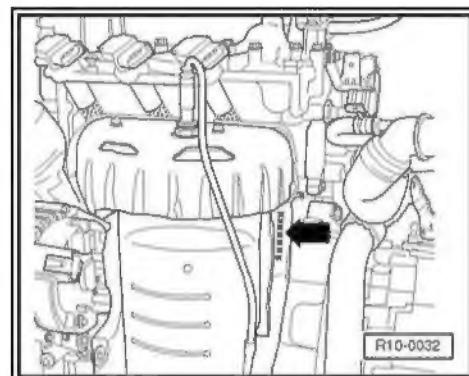
(VRL013435; Edition 09.2019)

Engine number ➔ [page 1](#) .

#### 1.1 Engine number

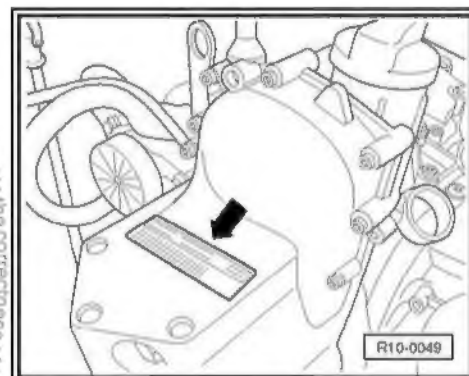
The engine number is comprised of nine digits (alphanumeric) at most. The first part (max. of 3 identification letters) represents the "engine ID letters"; the second part (6 characters) is the "serial number". If more than 999,999 engines with the same engine codes are produced, the first of the six digits is replaced by a letter.

The engine number ("engine identification letters" and "serial number") is engraved on the front surface of the engine block, next to the speed box.



Additionally, on the right engine support there is a sticker -arrow- with the "engine identification letters" and the "serial number".

The engine identification letters are also shown on the vehicle data sticker.



#### 1.2 Engine characteristics

Identification letters		BMD	CHFB	CHFA
Production		From 05.04 to 07.09	From 03.09 to 09.10	From 09.10 to 07.11
Cylinder volume	cm <sup>3</sup>	1198	1198	1198
Output	hp(kW)/rpm	55(40)/4750	55(40)/4750	60(44)/5200
Torque	Nm(mkgf)/rpm	106(10.9)/3000	108(11.0)/3000	108(11.0)/3000
Diameter	mm	76.5	76.5	76.5
Stroke	mm	86.9	86.9	86.9
Compression rate		10.3	10.3	10.3
Valves per cylinder		2	2	2
Octane number	minimum	95 lead-free <sup>1)</sup>	95 lead-free <sup>1)</sup>	95 lead-free <sup>1)</sup>
Injection, ignition		Simos 3PG <sup>2)</sup>	Simos 9.1	Simos 9.1
Knock control		1 knock sensor	1 knock sensor	1 knock sensor
Lambda control		2 probes	2 probes	2 probes



Identification letters	BMD	CHFB	CHFA
Catalytic converter	yes	yes	yes
exhaust gas recirculation	no	no	no
Supercharged	no	no	no

- 1) in exceptional cases, octane rating of at least 91, but with reduced power  
2) Simos 3 PG installed until May/2006, Simos 9.1 began starting in June/2006.





## 10 – Removing and installing engine

### 1 Engine - remove and install

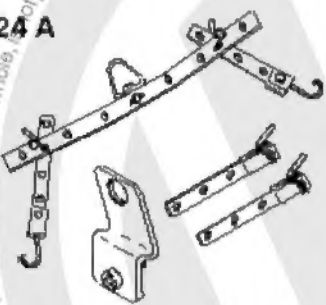

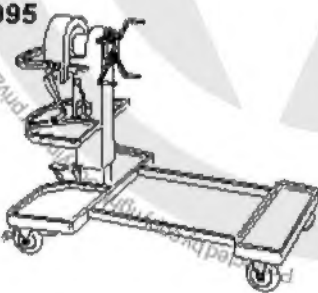

Removal ⇒ [page 4](#) .

Additional notes and assembly works in vehicles with air conditioning ⇒ [page 7](#) .

Installation ⇒ [page 7](#) .


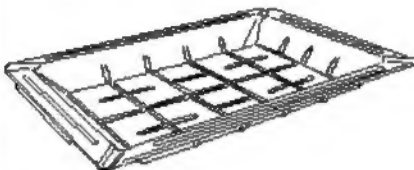
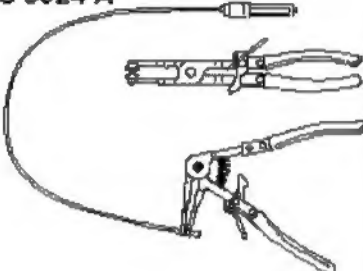
Tightening torque ⇒ [page 8](#) .

Special tools and workshop equipment required

<p><b>2024 A</b></p> 	<p><b>VAS 6100</b></p> 
<p><b>VAS 6095</b></p> 	<p><b>V.A.G 1331</b></p> 
	<p>W10-10016</p>

- ◆ Suspensor or 2024A - VW 055-
- ◆ Mobile hydraulic winch - 500Kg or VAS 6100 - EQ 7025-
- ◆ Rotating engine and gearbox stand - VAS 6095-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



<b>V.A.G 1332</b> 	<b>VAS 6208</b> 
<b>VAS 5024 A</b> 	
	<b>W10-10018</b>

- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Container - VAS 6208-
- ◆ Standard Pliers for spring-type clip or VW 5162 - VAS 5024A-
- ◆ Grease - G 000 100-
- ◆ Clip

## 1.1 Removal - recommendations



### Note

For the next sequence of operations the earth wire must be disconnected from Battery - A- . Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting earth wire from the Battery - A- .

- The engine is removed from the front along with the transmission.
- With the ignition turned off, disconnect the earth wire from the battery - A- .

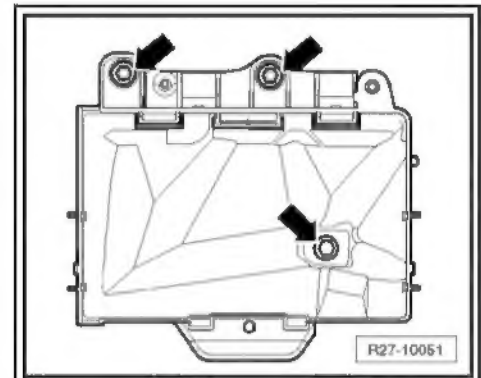




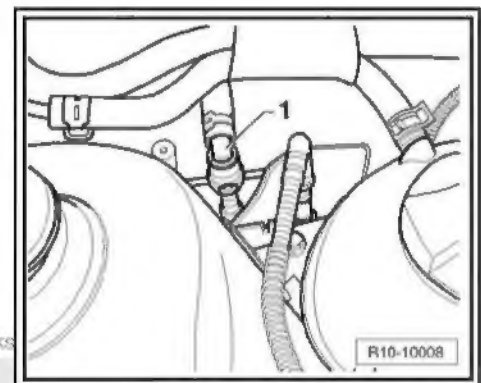
- All clamps loosened or cut during the removal of the engine should be place again in the same position during the installation of the engine.
- Remove air filter set ⇒ [page 105](#) .
- Remove the Battery - A- and the Battery - A- tray -arrows- ⇒ Electrical equipment; Rep. gr. 27 ; Starter, alternator, battery .
- Open and close the coolant reservoir lid to depressurize the cooling system.
- Loosen/detach all electric cables, from the gearbox, the Alternator - C- and from the Starter - B- .
- Loosen/separate all necessary remaining electric cables from the engine.

**WARNING**

*The fuel supply tube is under pressure! Wear protection goggles and gloves to avoid injuries and prevent contact with the skin. Before loosening the tube connections, wrap the connection points with cloth. Eliminate the pressure, carefully pulling the tube.*



- Loosen the fuel supply pipes -1- (press the key to unlock it).
- Remove the hose for the Electromagnetic valve 1 for activated charcoal reservoir - N80- on the intake manifold.
- Close the hoses, to prevent the entrance of impurities in the fuel system.
- Follow cleaning rules ⇒ [page 76](#) .
- Remove vacuum and aeration hoses from the engine.
- Remove the connector from the Radiator fan thermal switch - F18- and from the Radiator fan - V7- .
- Remove the fastening screw from the sustaining handle of the front exhaust tube in the transmission.
- Loosen the front exhaust tube from the catalyzer ⇒ [page 119](#) .



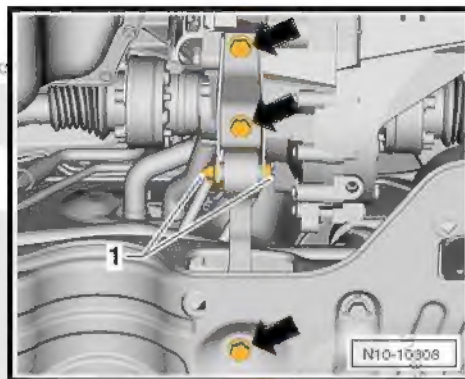


- Remove the pendulum support from the gearbox -arrows-.



### Caution

*Do not loosen fastening -1-.*



- Remove clutch actuator hydraulic cylinder: ⇒ Automatic/mechanical transmission; Rep. gr. 30 ; Clutch - command system .
- Remove transmission gearshift mechanism: ⇒ Automatic/mechanical transmission; Rep. gr. 34 ; Drive, housing .
- Drain the cooling system ⇒ [page 66](#) .
- Remove engine cooling system hoses with VW 5162 or Standard-type clamp pliers - VAS 5024A- .
- Remove the Poly-V belt ⇒ [page 14](#) .
- Put front panel in work position: ⇒ Body - Front section; Rep. gr. 50 ; Body - Rear section.

### Vehicles with air conditioning

- Remove air conditioning compressor: ⇒ Ventilation system; Rep. gr. 87 ; Air conditioning and anchor in the body with a wire.
- Observe additional instructions and assembly activities ⇒ [page 7](#)

### Continued for all vehicles

- Remove the drive shafts, from the left side and from the right side of the transmission, and fasten them on top: ⇒ Chassis; Rep. gr. 40 ; Front suspension .
- Install the Suspensor or VW 055 - 2024A- and lift it with the hydraulic hoist.

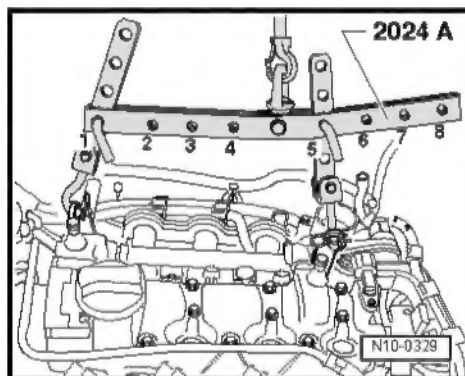
Pulley side: position 1 of the vertical rod. Orifice on the sustaining bar in position 1.

Flywheel side: position 2 of the vertical rod. Orifice on the sustaining bar in position 5.



### Caution

*Use safety pins in the hooks and fitting pins, so as to prevent damages in the engine and in the vehicle.*



### Note

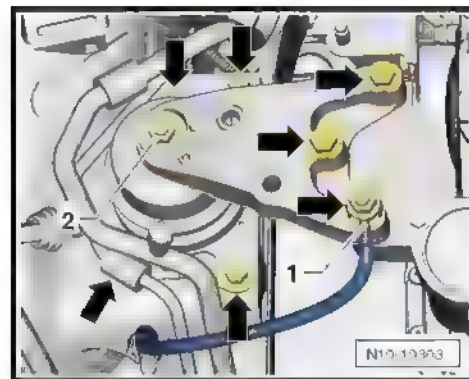
- ◆ Positions numbered 1...8 on suspension bar are oriented from the pulley side.
- ◆ The holes in the supports are counted from the hook.



- Remove the support of the prower-drive group, engine -arrows-.

**Caution**

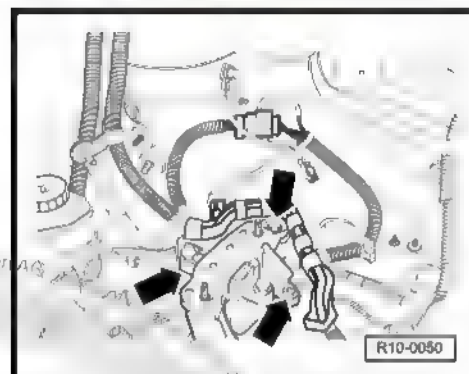
*Do not loosen fastening -2-.*



- Remove the support of the prower-drive group, transmission -arrows-.
- Remove the assembly from the front. For such, displace the assembly and lift it gradually until passing it over the front panel.

**Note**

*The assembly has to be carefully guided, while being lifted, to avoid damages in the body.*



To perform the removal works, the engine has to be anchored in the Rotary stand for engine and transmission - VAS 6095- .

- Remove the transmission from the flange of the engine.
- Fasten the engine to the Rotary stand for engine and transmission - VAS 6095- .

## 1.2 Additional notes and assembly works in vehicles with air conditioning

**Note**

*To avoid damage to the condenser and cooling gas hoses, do not kink, twist nor overstretch the hoses.*

To remove and install the engine without opening the refrigerant circuit:

- Remove the clamps from the cooling gas hoses.
- Remove the Poly-V belt ⇒ [page 14](#) .
- Remove the air conditioning compressor from the support with the cooling gas pipes turned on: ⇒ Ventilation system; Rep. gr. 87 ; Air conditioning .

## 1.3 Installation

Installation is carried out by reversing the removal order, considering the following:

- Check the clutch bearing as for wear and replace it, if necessary.
- Lightly lubricate the clutch roller bearing, the guide roller bearing and the primary shaft with Grease - G 000 100- .
- Check that the guides for coupling the engine and gearbox are placed on the engine block and, if necessary, install them.



- When lowering the assembly, make sure it does not beat the drive shafts.
- Adjust the engine supports without tensions.



#### Note

*Tightening torque for the assembly ➔ [page 8](#) .*

- Install drive shafts: ➔ Chassis; Rep. gr. 40 ; Front suspension .

Vehicles with air conditioning

- Install air conditioner compressor: ➔ Ventilation system; Rep. gr. 87 ; Air conditioning .

Continued for all vehicles

- Electric and installation connections: ➔ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install Poly-V belt ➔ [page 14](#) .
- Install clutch actuator hydraulic cylinder: ➔ Automatic/mechanical transmission; Rep. gr. 30 ; Clutch - command system .
- Install transmission gearshift mechanism ➔ Automatic / mechanical transmission; Rep. gr. 34 ; Drive, housing .

Continued for all vehicles

- Replenish cooling system ➔ [page 66](#) .
- Install air filter set ➔ [page 105](#) .
- Adapt the Engine control unit - J623- to the Accelerator butterfly valve control unit - J338- ➔ Vehicle diagnostic tester.
- Perform test run and check fault memory ➔ [page 116](#) .

## 1.4 Tightening torques

Assignment		Tightening torque
Nuts and bolts	M 6	10 Nm
	M 8	20 Nm
	M 10	45 Nm
	M 12	60 Nm
Exhaust pipe to manifold		40 Nm

Power unit mounting bracket



#### Note

*The power unit support fastening screws are expansion screws and must be replaced.*





**Power-drive group support (engine side):**

- ◆ A <sup>3)</sup> = 20 Nm + 90°
- ◆ B <sup>3)</sup> = 30 Nm + 90°



**Caution**

**Do not loosen fastening -arrow-**

3) Renew after each removal.

**Power-drive group support (gearbox side):**

- ◆ A <sup>4)</sup> = 40 Nm + 90°
- ◆ B <sup>4)</sup> = 50 Nm + 90°
- ◆ C <sup>4)</sup> = 50 Nm + 90°

4) Renew after each removal.

**Pendulum support (torque restrictor):**

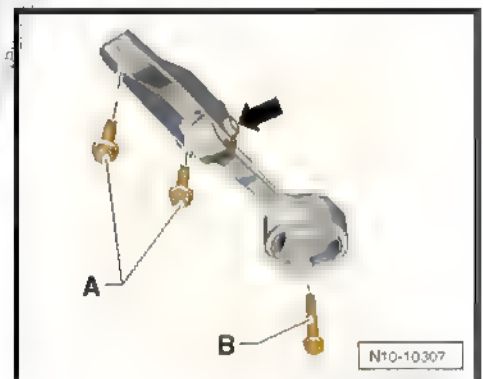
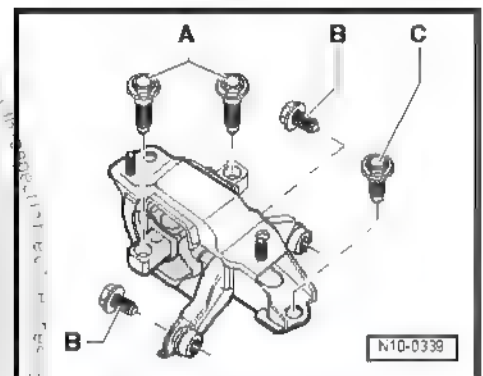
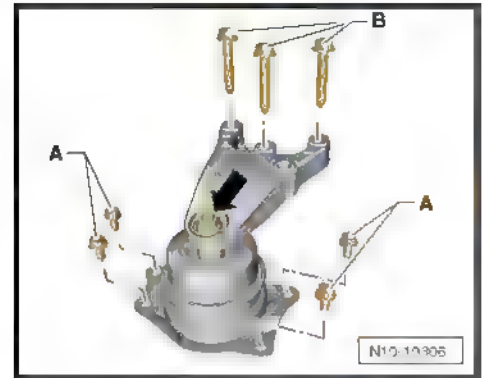
- ◆ A <sup>5)</sup> = 30 Nm + 90°
- ◆ B <sup>5)</sup> = 40 Nm + 90°

5) Renew after each removal



**Caution**

**Do not loosen fastening -arrow-**





## 13 – Crankshaft group

### 1 Engine - assembly and disassembly



#### Caution

*The crankshaft cannot be removed. All it takes is to loosen the screws from the bearing cover of the crankshaft for the bearing shells of the engine block to become deformed. That deformation reduces the gap of the bearing shells. Even if the bearing shells are not replaced, damages due to the change of the gap can be caused.*

*If the screw of the bearing cover is loosened, the whole engine block with the crankshaft will have to be replaced.*

*It is not possible to measure the radial gap of the crankshaft with the means available in the workshop.*

*Pistons cannot be removed.*

To carry out the disassembly the engine must be mounted on the Rotating engine and transmission stand - VAS 6095- .

Part I - Belt actuation ⇒ [page 10](#) .

Part II - Chain actuation ⇒ [page 11](#) .

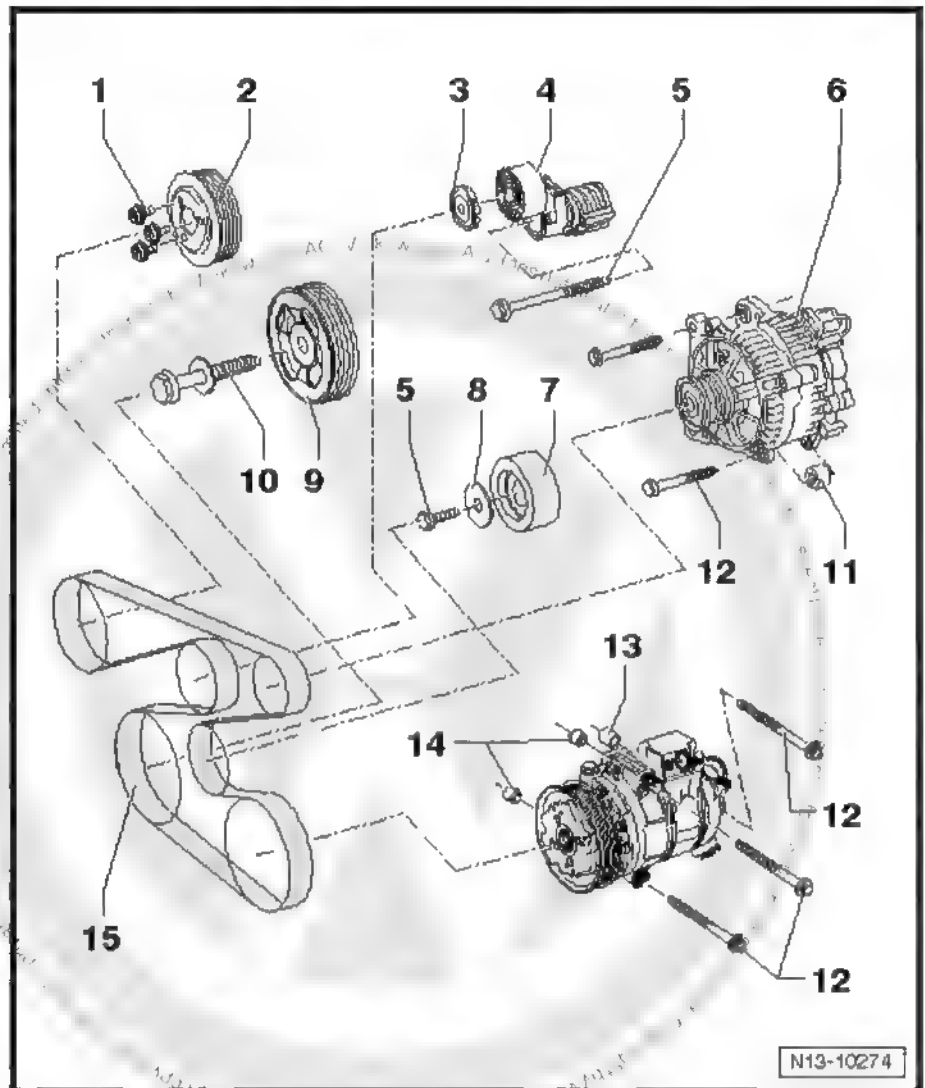
Remove and install of Poly-V belt ⇒ [page 14](#) .

Remove and install the command box ⇒ [page 15](#) .

#### 1.1 Part I - Poly-V belt actuation



- 1 - 20 Nm
- 2 - Pulley
  - ☐ Water pump pulley.
- 3 - Cover
- 4 - Poly-V belt tensioning pulley
- 5 - 20 Nm + 90°
  - ☐ Renew once removed
- 6 - Alternator
- 7 - Idler roller
- 8 - Washer
- 9 - Pulley
  - ☐ Crankshaft.
- 10 - 90 Nm + 90°
  - ☐ Renew once removed
- 11 - Guide bushing
- 12 - 25 Nm
- 13 - Guide bushing
- 14 - Spacer sleeve
- 15 - Poly-V belt
  - ☐ Mark rotation direction before removing it.
  - ☐ Remove and install of Poly-V belt  
⇒ [page 14](#) .



## 1.2 Part II - Chain actuation



### Caution

*The crankshaft cannot be removed. All it takes is to loosen the screws from the bearing cover of the crankshaft for the bearing shells of the engine block to become deformed. That deformation reduces the gap of the bearing shells. Even if the bearing shells are not replaced, damages due to the change of the gap can be caused.*

*If the screw of the bearing cover is loosened, the whole engine block with the crankshaft will have to be replaced.*

*It is not possible to measure the radial gap of the crankshaft with the means available in the workshop.*

*Pistons cannot be removed.*



**1 - Cylinder head cover**

- ☐ The seal surface can not be ground.
- ☐ With integrated camshaft bearings.
- ☐ Remove old residues of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- .
- ☐ Before installation, apply a layer of Sealing putty for engines - AMV 188 001 02- or Sealing putty for engines - D 154 103 A1- .
- ☐ For installation, place in the vertical position, from top down, with the adjustment pins in holes of the head.

**2 - Cylinder block**

- ☐ 2 units.
- ☐ The bolts must not be loosened.

**Note**

*Pistons cannot be removed.*

**3 - Gear**

- ☐ Crankshaft.

**4 - Gear**

- ☐ Rock-shaft.

**Note**

*The fastening screw can not be loosened.*

**5 - Chain tensioner with tensioning chute**

- ☐ From roller chain ⇒ [Item 10 \(page 12\)](#) .

**6 - Oil pump**

- ☐ Replace complete only.

**7 - Sliding chute**

- ☐ From roller chain ⇒ [Item 33 \(page 13\)](#) .

**8 - Gear**

- ☐ Crankshaft.

**9 - Gear**

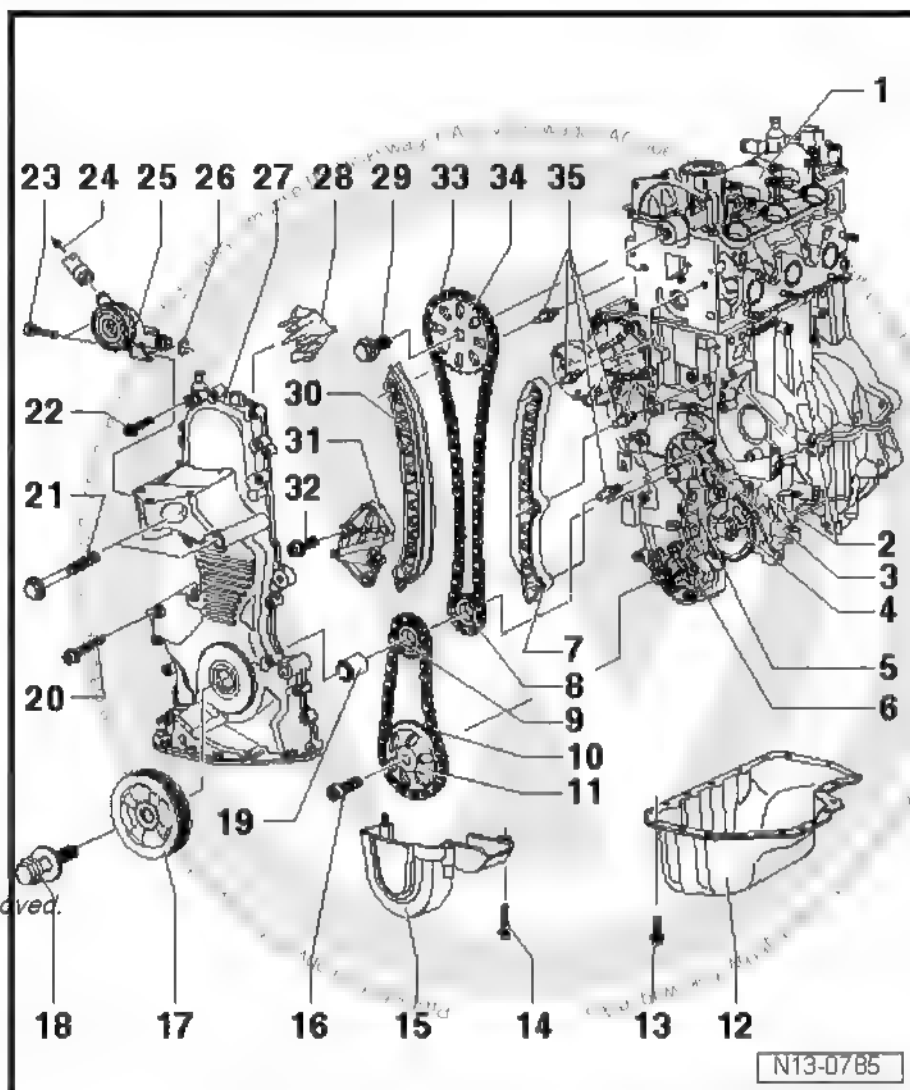
- ☐ From oil pump actuation.

**10 - Roller chain**

- ☐ Mark rotation direction before removal (installation position).

**11 - Gear**

- ☐ From oil pump.
- ☐ After installing, adjust the valve timing ⇒ [page 35](#) .





## 12 - Crankcase

- ☐ Remove and install in motors with liquid gasket ➤ [page 57](#) .
- ☐ Clean the surface from Engine silicone sealant - D 176 404 A2 ou A3- before the installation.
- ☐ Install using Silicone sealant for engines - D 176 404 A2 ou A3- .

13 - 15 Nm

14 - 8 Nm

15 - Cover

16 - 20 Nm + 90°

- ☐ Renew after each removal.

17 - Crankshaft pulley

- ☐ Remove and install of Poly-V belt ➤ [page 14](#) .

18 - 90 Nm + 90°

- ☐ Renew after each removal.
- ☐ Lubricate prior to fitting.
- ☐ Immobilize the crankshaft pulley with the Spanner - 3415- .
- ☐ The angular torque can be measured with a wrench, e.g. Hazet 6690.

19 - Supporting bushing

- ☐ Replace the sealing ring upon each removal.

20 - 25 Nm

21 - 45 Nm

22 - 10 Nm

23 - 10 Nm

24 - To intake manifold

25 - Oil separator

- ☐ With pressure valve.

26 - Seal

- ☐ Replace if damaged.

27 - Commando box

- ☐ Install with Silicone sealant for engines - D 176 404 A2 ou A3- .
- ☐ For better alignment in the installation, install two vertical screws -M6 x 75mm- in the head and in the engine block.
- ☐ For better alignment of the command box, install the crankcase with two screws.

28 - Cover

29 - 20 Nm + 90°

- ☐ Renew after each removal.

30 - Tensioning chute

31 - Belt tensioner

32 - 9 Nm

33 - Roller chain

34 - Gear

- ☐ Of valve camshaft.
- ☐ Immobilize the gear with Special tool - 3036- .

35 - Guide pin

- ☐ 20 Nm.

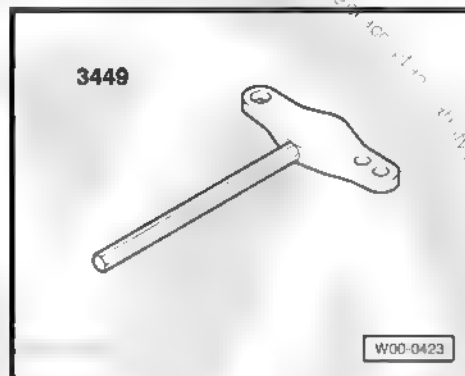




### 1.3 Poly-V belt - remove and install

Special tools and workshop equipment required

- ◆ Hexagonal wrench - 3449-



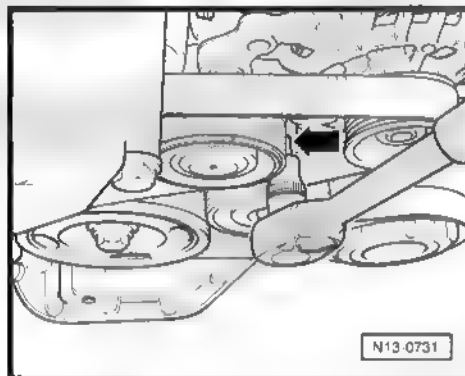
Operation sequence



Note

Mark the Poly-V belt turning direction.

- Move the tensioning element towards the -arrow- until the hole becomes visible. Hold the tensioning element with the Hexagonal wrench - 3449- .



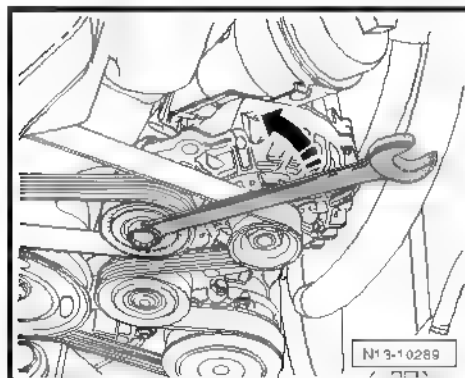
- Move the tensioning element towards the -arrow- with socket and a wrench. Hold the tensioning element with the special tool - 3449- .
- Remove and install of Poly-V belt .



Note

In the installation of the Poly-V belt, make sure there is the right seating of the belt on the pulleys.

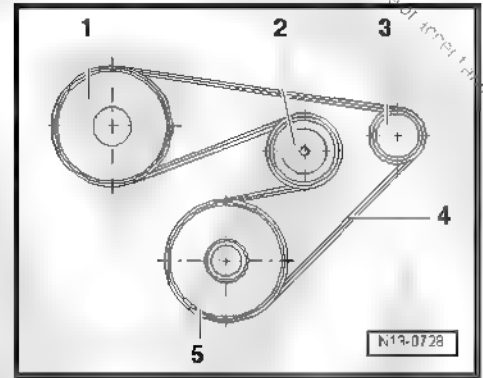
Poly-V belt routing





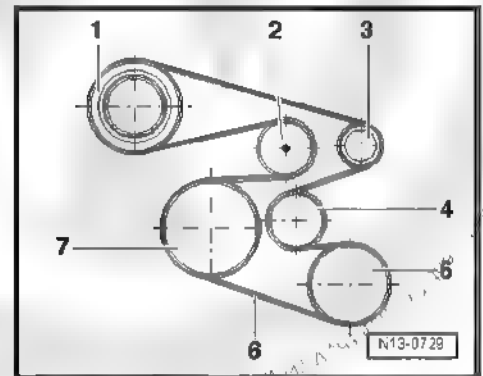
Operate the belt without the air conditioning compressor

- 1 - Water pump pulley
- 2 - Tensor pulley
- 3 - Generator (Alternator) - C- pulley
- 4 - Poly-V belt
- 5 - Crankshaft pulley



Operate the belt with the air conditioning compressor

- 1 - Water pump pulley
- 2 - Tensor pulley
- 3 - Generator (Alternator) - C- pulley
- 4 - Pulley
- 5 - Air conditioning compressor pulley
- 6 - Poly-V belt
- 7 - Crankshaft pulley

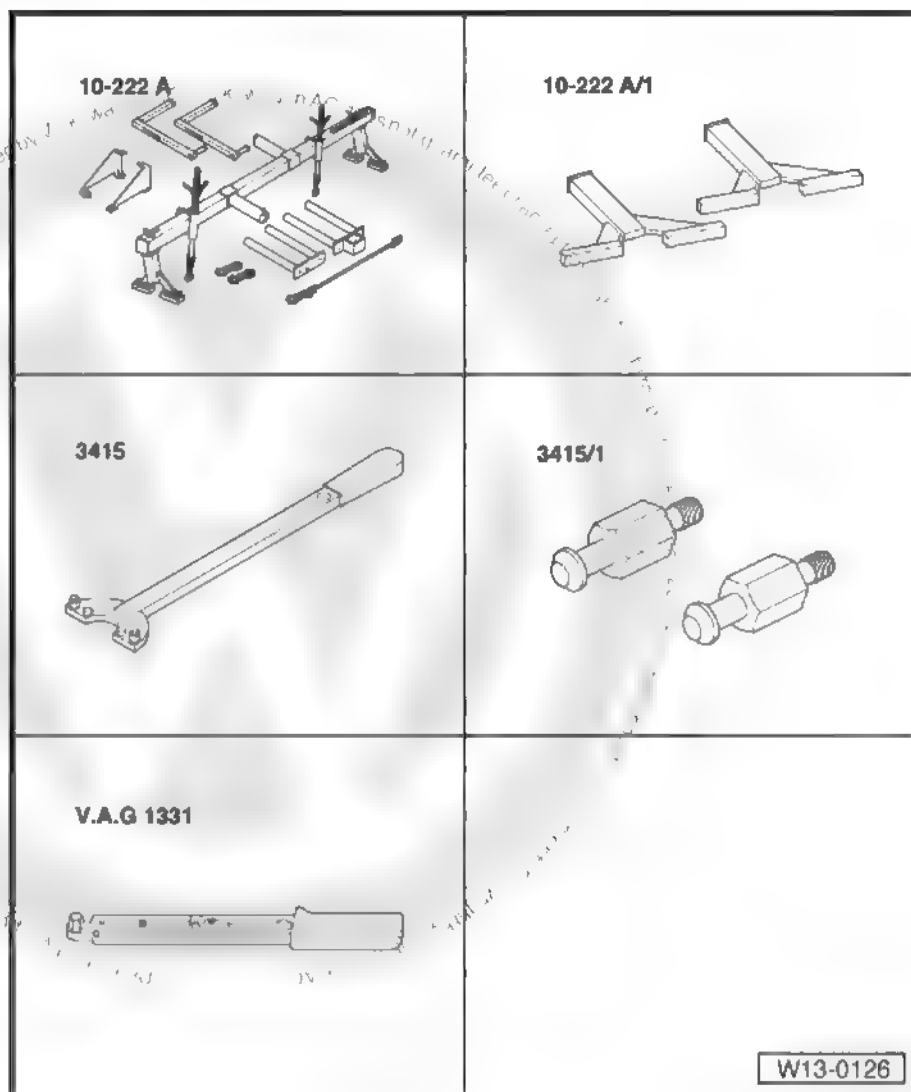


Install by inverting removal sequence.

#### 1.4 Command box - remove and install



Special tools and workshop  
equipment required



- ◆ Support or 10-222A - VW 061-
- ◆ Claws - 10-222 A/1-
- ◆ Wrench - 3415-
- ◆ Pins - 3415/1-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



## V.A.G 1332

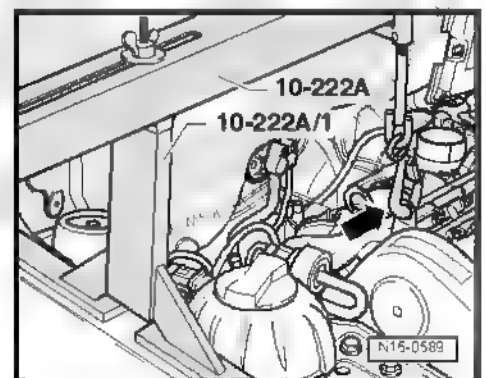


W00-0428

◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-

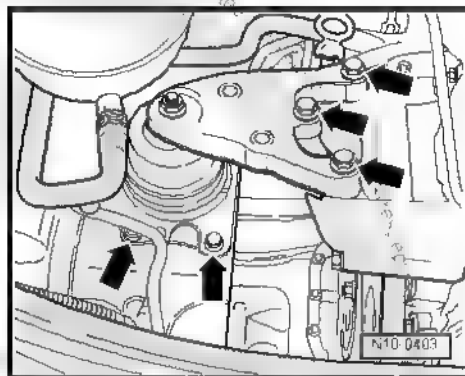
### 1.4.1 Removal

- Remove the front right wheel case protector: ⇒ General body repairs, exterior; Rep. gr. 66 ; External equipment .
- Mark the operating direction of the Poly-V belt, and remove it ⇒ [page 14](#) .
- Remove the air conditioning compressor from the support with the pipes on: ⇒ Ventilation system; Rep. gr. 87 ; Air conditioning .
- Remove the Alternator - C- ⇒ Electrical equipment; Rep. gr. 27 ; Alternator; Alternator - remove and install .
- Install the Support - 10-222 A- with the Clamps - 10 - 222 A / 1- , as shown, and install in the suspension eyelet -arrow-.

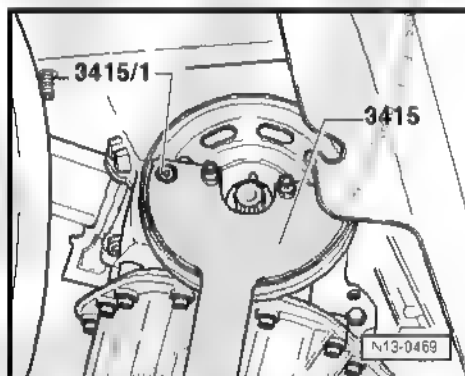




- Pre-tension the engine slightly and loosen the fastening screws -arrows-.
- Remove oil crankcase ➤ [page 57](#).



- Remove fastening bolt from crankshaft pulley. Immobilize the pulley with Wrench - 3415- and -3415/1-.

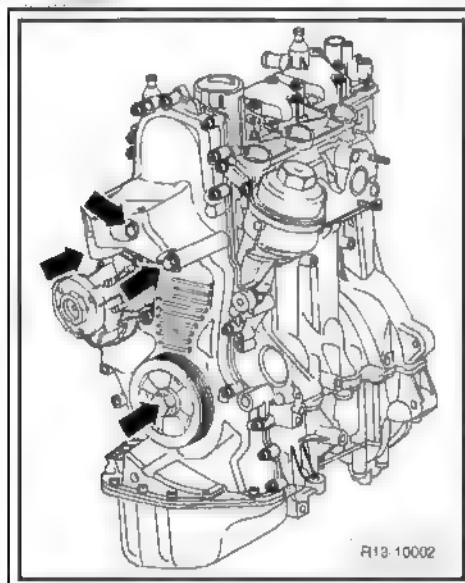


- Remove the fastening screws from the command box and the screws indicated with the -arrows-.
- Remove the command box.



#### Note

*Make sure the support pin of the crankshaft remains in the sealing flange.*



### 1.4.2 Installation

- Rigorously clean the sealing surfaces. Those must be free from oil and lubricant.
- Seat the new joint in the adjustment pin.
- To make the alignment easier, install two Screws - M6x80- in the head and in the engine block.
- Install the command box, the crankshaft support, simultaneously in the thread-headed pins, in the adjustment pins, and in the crankshaft's crankpin.
- Uniformly tighten the fastening screws of the command box in a cross pattern.

Make sure the camshaft does not get stalled.





#### Tightening torque

- ◆ M6 screw = 10 Nm.
- ◆ M10 screw = 50 Nm

The rest of the installation is processed in the reverse order from removal





## 2 Engine block, sealants

Removal and installation ➔ [page 20](#)

Renew the crankshaft seal (pulley side): ➔ [page 21](#) .

Replace crankshaft seal - flywheel side ➔ [page 22](#) .

### 2.1 Crankshaft sealants

1 - 90 Nm + 90°

- ☐ Renew after each removal.
- ☐ Lubricate prior to fitting.
- ☐ Immobilize the crankshaft pulley with the Spanner - 3415.
- ☐ The angular torque can be measured with a wrench, e.g. Hazet 6690.

2 - Washer

3 - Crankshaft pulley

- ☐ Remove and install of Poly-V belt ➔ [page 14](#) .

4 - Support sleeve

- ☐ Replace the sealing ring upon each removal

5 - Crankshaft seal (pulley side)

- ☐ Replace ➔ [page 21](#) .

6 - Cylinder block

7 - 60 Nm + 90°

- ☐ Renew after each removal.

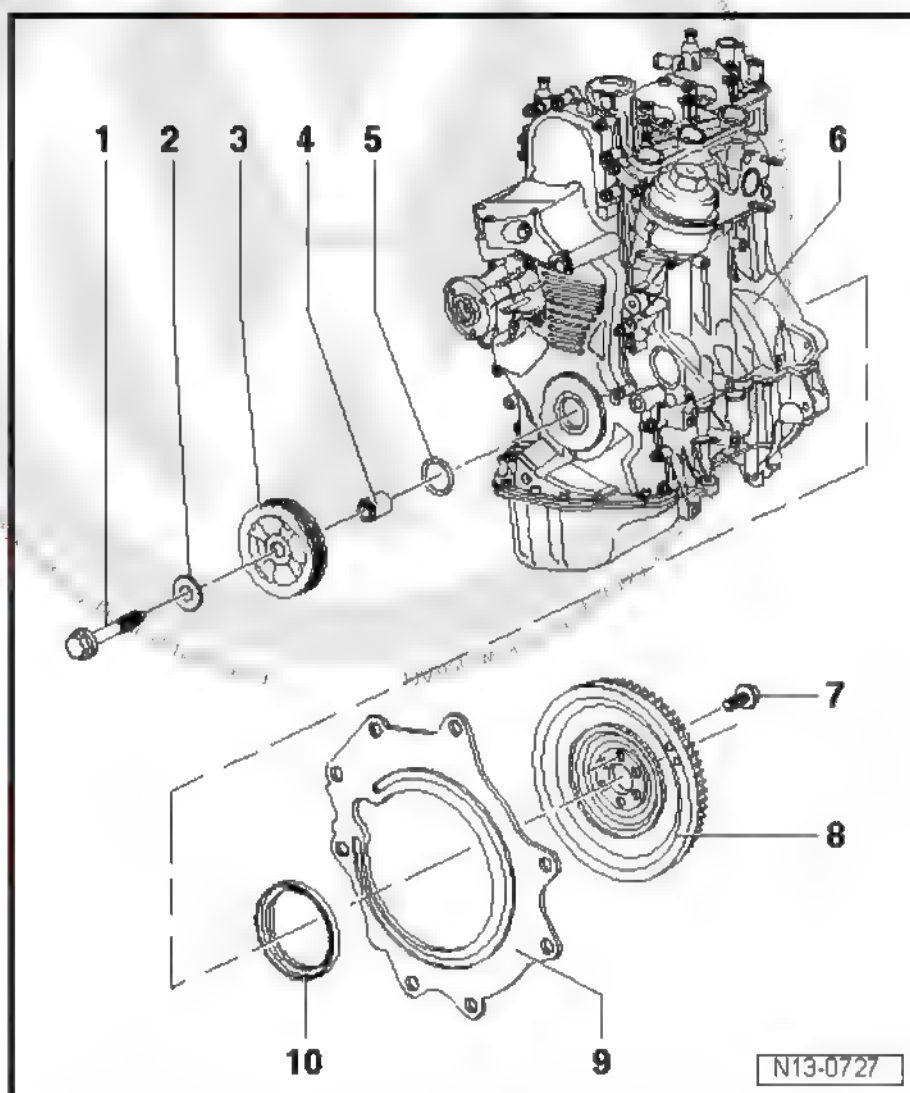
8 - Flywheel

9 - Intermediate plate

- ☐ It has to seat on the adjustment guide.
- ☐ Do not damage/twist in the removal and installation works

10 - Crankshaft sealant (flywheel side)

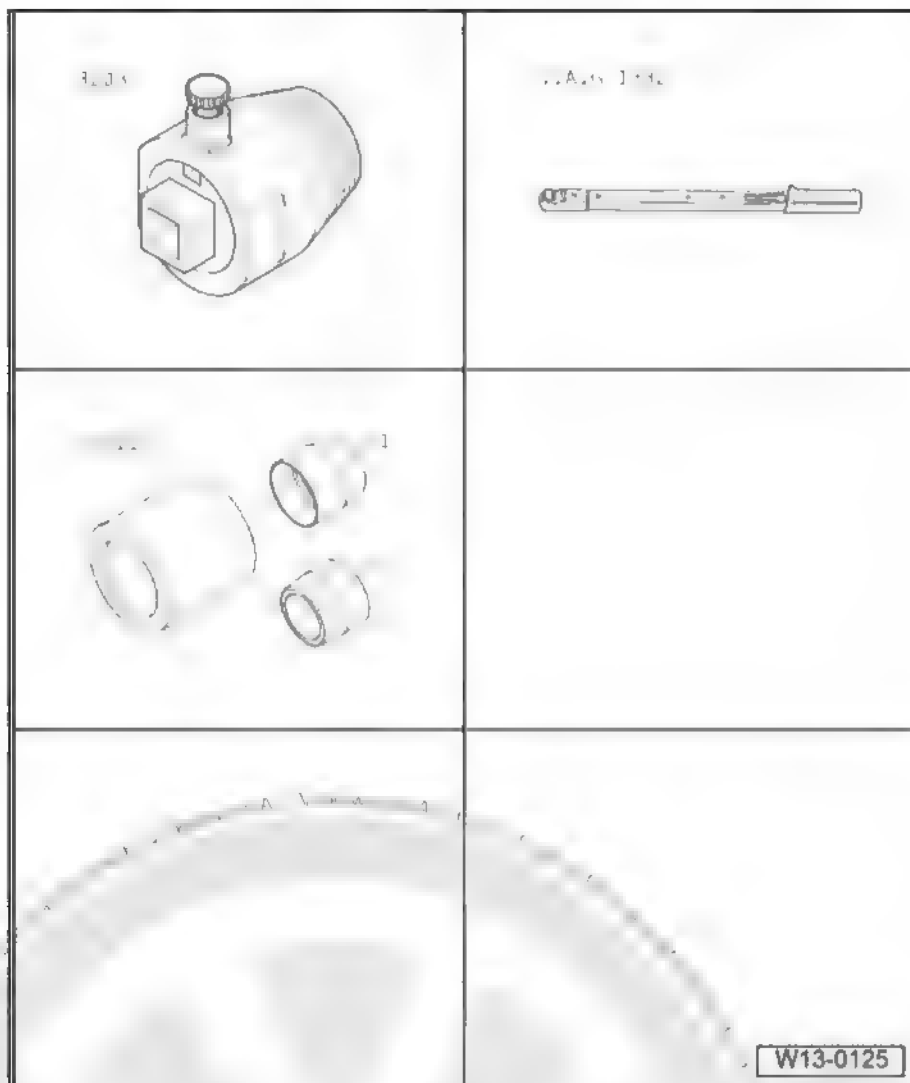
- ☐ Replace ➔ [page 22](#) .





## 2.2 Crankshaft seal (pulley side) - replace

Special tools and workshop equipment required

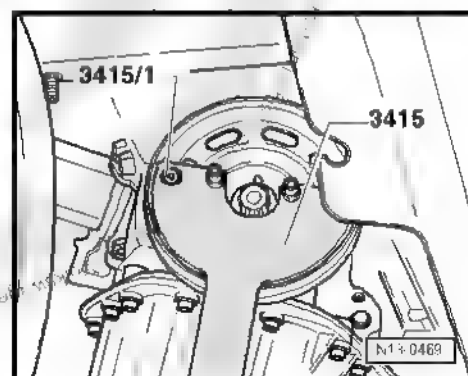


W13-0125

- ◆ Puller - 3203-
- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Assembly tool - T10117-

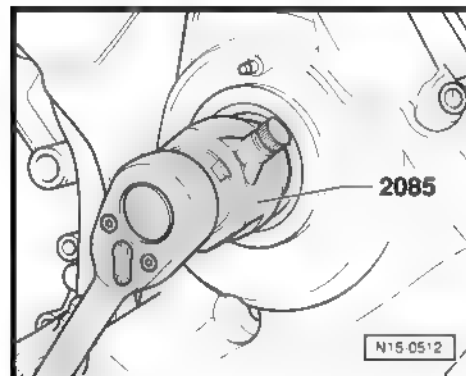
### 2.2.1 Removal

- Remove the Poly-V belt ⇒ [page 14](#) .
- Remove fastening bolt from crankshaft pulley. Immobilize the crankshaft pulley with the Spanner - 3415- and -3415/1- .
- Remove the central fastening bolt and remove crankshaft pulley.
- Turn the internal part of the Puller - 2085- three turns (nearly 5 mm) from the external part and lock with the knurled screws.



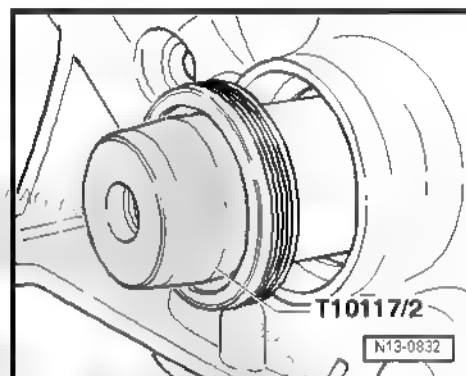


- Lubricate the puller's threaded head, seat it and strongly screw it in the sealant as much as possible.
- Loosen the knurled screw and turn the inner part against the crankshaft until the seal is extracted



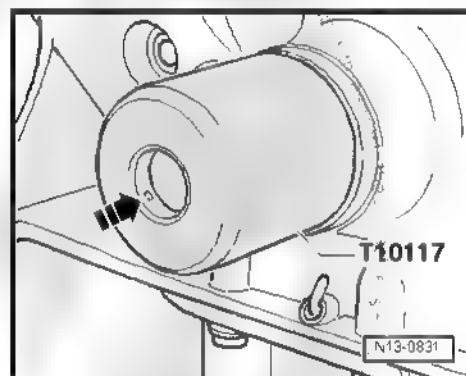
## 2.2.2 Installation

- Seat the Sleeve - T 10117/2- in the trunnion and move the seal.
- Remove the Sleeve - T 10117/2- .



- Press the seal with the Pressure sleeve - T10117- up to the stop of the command box through uniform blows.

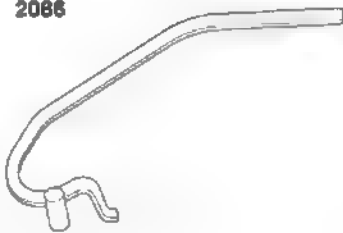


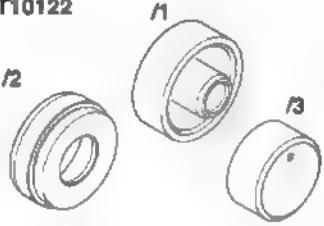
The rest of the installation is processed in the reverse order from removal.



## 2.3 Crankshaft sealant (flywheel side) - replace



Special tools and workshop  
equipment required

<p><b>2086</b></p> 	<p><b>V.A.G 1331</b></p> 
<p><b>V.A.G 1332</b></p> 	<p><b>T10122</b></p> 
	<p>W13-0129</p>

- ◆ Pulling hook - 2086-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Inserting device - T10122-



Note

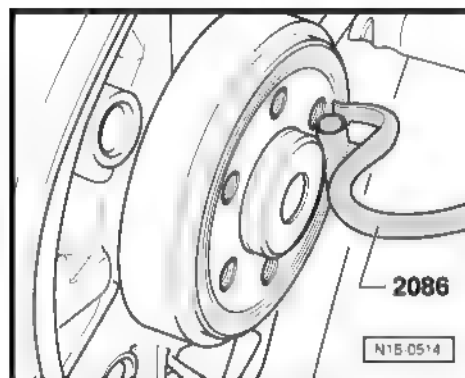
- ◆ *To better show work sequences, those were carried out with the engine removed.*
- ◆ *The work sequences with both engine and transmission removed are identical*

### 2.3.1 Removal

- Remove the clutch assembly and the flywheel.



- Remove seal with the Pulling hook - 2086- .



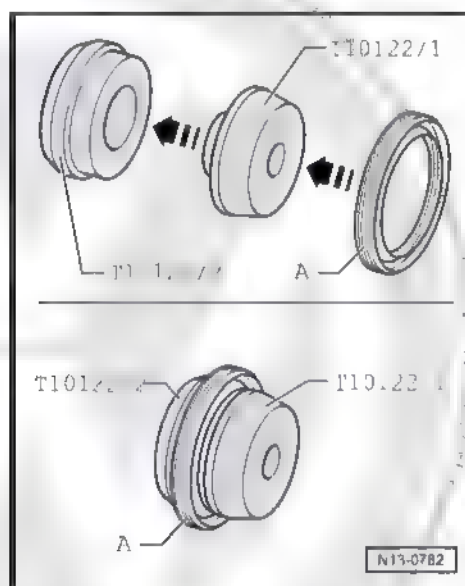
## 2.3.2 Installation



### Note

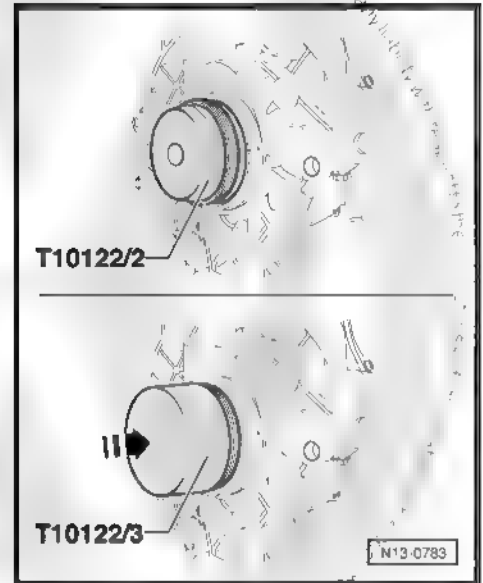
*Only remove the support ring from the sealant immediately before its installation.*

- Join Assembly shells - T 10122/1- and -T10122/2- .
- Move sealant -A- onto Assembly shell - T10122/2- up to the stop.
- Separate both assembly shells.



- Install the Assembly shell - T 10122/2- with the sealant onto the crankshaft flange.
- Press the seal with the Pressure shell - T 10122/3- up to the stop.

The rest of the installation is processed in the reverse order from removal







## 15 – Cylinder head, valve gear

### 1 Cylinder head



#### Note

- ◆ *Whenever a new cylinder head is assembled, it is necessary to oil lubricate all stop surfaces between the support elements, roller rockers with cams of the camshaft, before the installation of the head cover*
- ◆ *The plastic bases supplied for protection of the open valves can only be removed immediately before the installation of the cylinder head.*
- ◆ *Whenever the engine cylinder head is replaced it is necessary to replace the coolant.*
- ◆ *Remove and install intake manifold and the injection valves  
⇒ [page 103](#).*

Cylinder head - remove and install ⇒ [page 28](#) .

Valve timing - check ⇒ [page 32](#) .

Roller chains - remove and install ⇒ [page 33](#) .

Valve timing - adjust ⇒ [page 35](#) .

Compression - check ⇒ [page 39](#) .

#### 1.1 Cylinder head - assembly and disassembly





**1 - Cylinder head cover**

- ☐ The seal surface can not be ground.
- ☐ With integrated camshaft bearings.
- ☐ Remove the residue of the old joint.
- ☐ Before installation, apply a layer of Sealing putty for engines - AMV 188 001 02-
- ☐ For installation, place in the vertical position, from top down, with the adjustment pins in holes of the head.

**2 - Sealing**

- ☐ Renew if damaged.

**3 - Oil reservoir lid**

**4 - 20 Nm**

**5 - Suspension eyelet**

**6 - Engine cylinder head screw**

- ☐ Renew after each removal.
- ☐ Observe installation instructions and sequence to loosen and tighten => [page 28](#).

**7 - From air filter assembly**

**8 - Vacuum hose**

**9 - Hall Sender - G49-**

**10 - 10 Nm**

**11 - Seal**

- ☐ Replace if damaged.

**12 - 10 Nm**

**13 - Mounting bracket**

- ☐ To harnesses.

**14 - Oil pressure switch - F1-**

- ☐ 0.3...0.7 bar
- ☐ 25 Nm
- ☐ Check => [page 39](#).

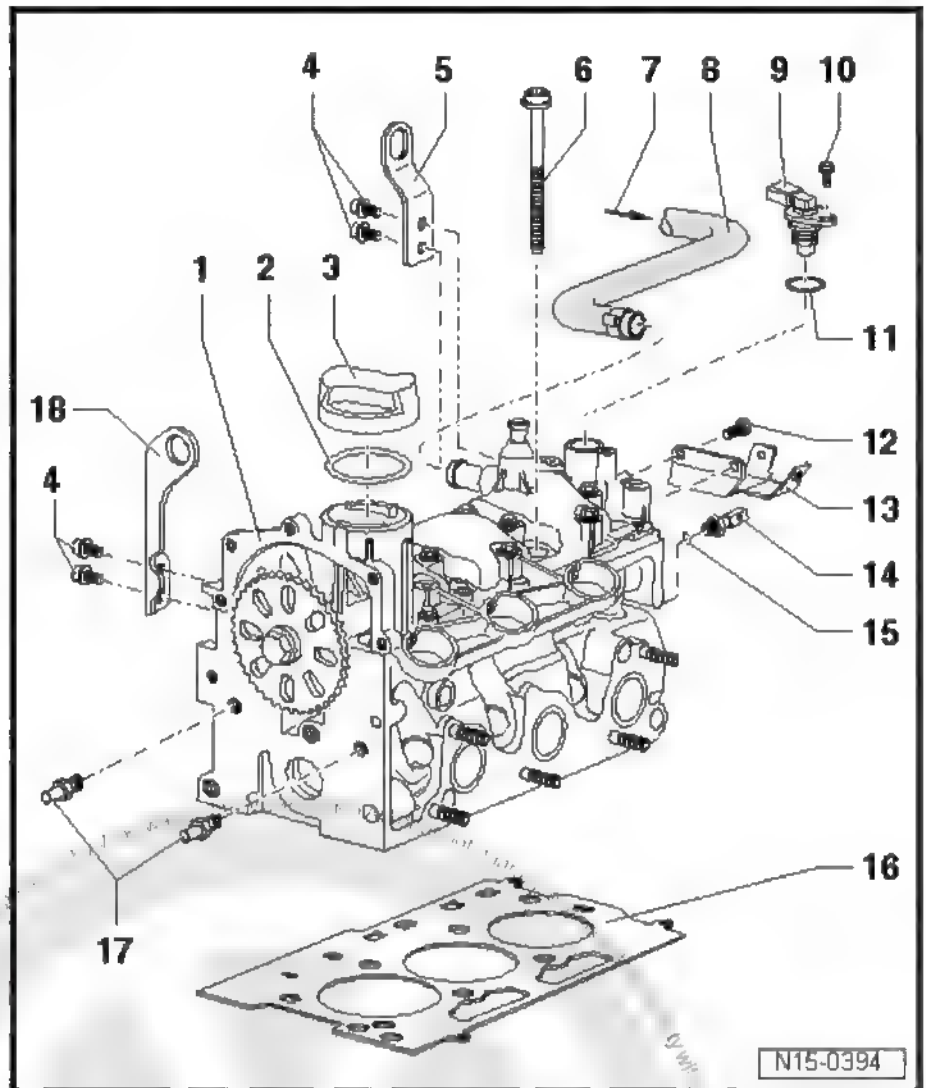
**15 - Sealing**

**16 - Cylinder head sealing gasket**

- ☐ Metal gasket.
- ☐ Renew after each removal.
- ☐ After replacing, replace coolant.
- ☐ Grinding of the engine block side cylinder head => [page 43](#)
- ☐ Check warping => [page 28](#)

**17 - Guide screw**

- ☐ Tightening torque: 20 Nm.





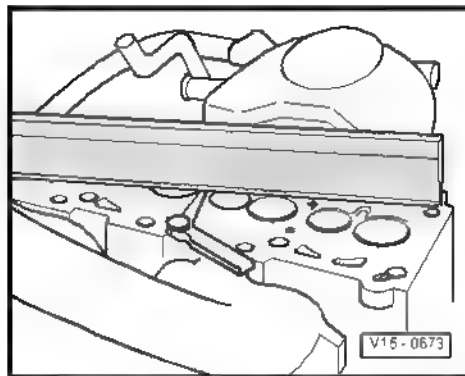
## 18 - Support eyelet

Check the cylinder head for warping



### Note

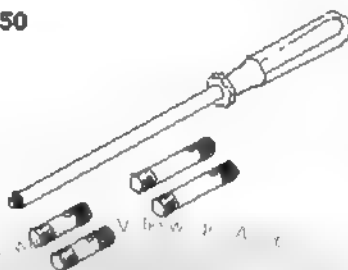
- ◆ *Maximum warping allowed: 0.05 mm*
- ◆ *Use the 500 mm light ruler - VAS 6075-*



## 1.2 Cylinder head - remove and install

Special tools and workshop equipment required

**3450**



**T10358**



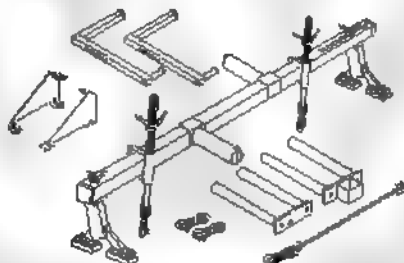
**V.A.G 1331**



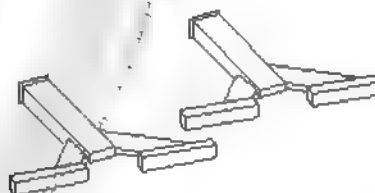
**V.A.G 1332**



**10-222 A**



**10-222 A/1**



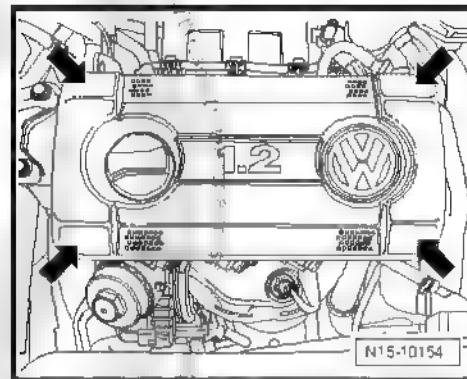
W15-10062

- ◆ Guides - 3450-
- ◆ Mounting bracket - T10358-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Support or VW 061 - 10-222A-
- The engine must have warm maximum temperature.

### 1.2.1 Removal

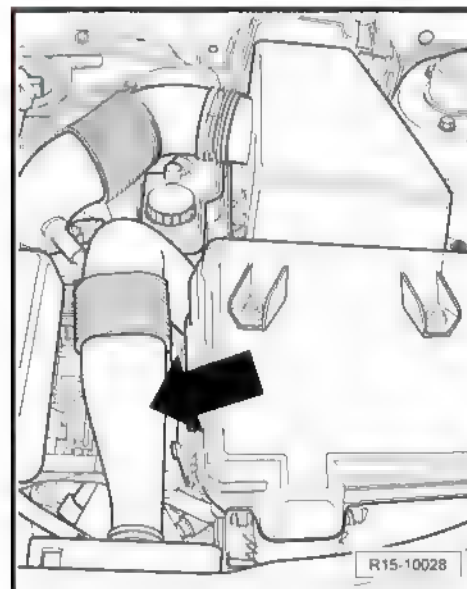
- Disassemble the engine cover, pulling at the places indicated with the -arrows-.



- Install the Support or VW 061 - 10-222A-, as shown, and coupled in the suspension eyelet -arrow-.
- Remove the command box ⇒ [page 15](#).
- Remove pulley from water pump.

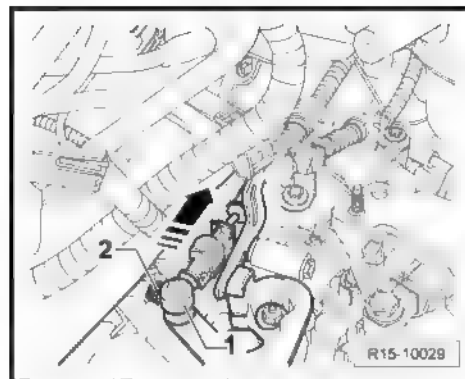


- Remove intake air duct from the air filter -arrow-.

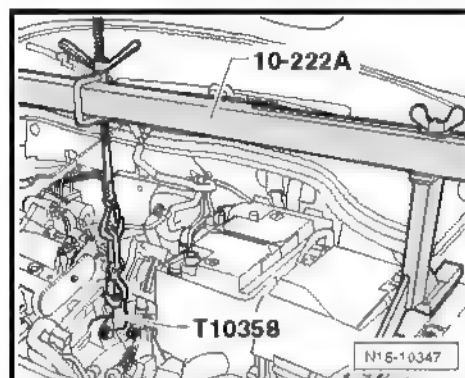




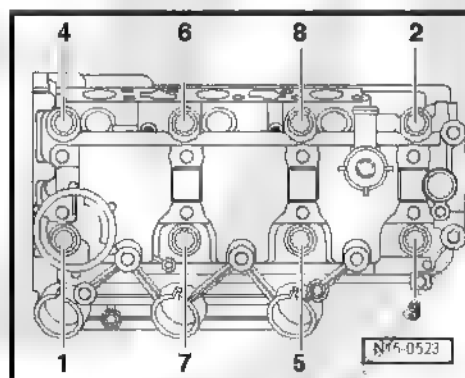
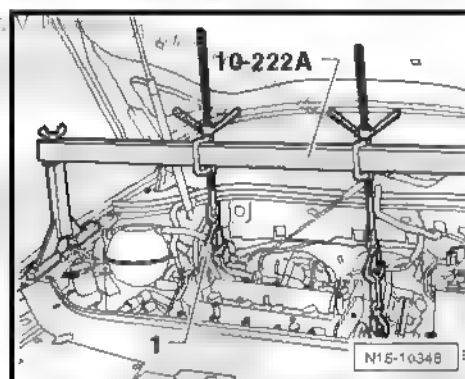
- Engage the first gear so that the fastening element of the gear selection cable -1- allows access to the transmission fastening nut and battery earth strap-2-.



- Loosen the fastening nut from the transmission and battery earth strap and install the Support - T10358- , as shown.
- Engage the hooks in the Support or VW 061 - 10-222A- in the Support - T10358- , as shown.
- Turn the spindle, until the hooks are under slight tension.



- Disengage hook -1- from the left side suspender eyelet and move the left spindle of the Support or VW 061 - 10-222A- .
- Remove the intake manifold ⇒ [page 103](#) .
- Remove the roller chains ⇒ [page 33](#) .
- Remove the engine cylinder head cover.
- Remove full fuel distributor, with all injecting valves, from engine cylinder head.
- Disconnect all other connection tubes, from cooling, vacuum and intake systems and from the engine cylinder head.
- Remove the front exhaust pipe from exhaust manifold .
- Loosen and remove the screws from the engine cylinder head in the indicated sequence.
- Carefully remove engine cylinder head.



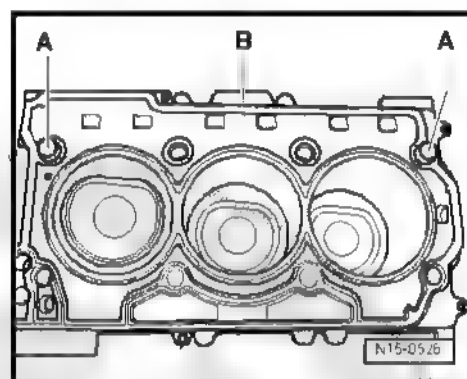


## 1.2.2 Installation

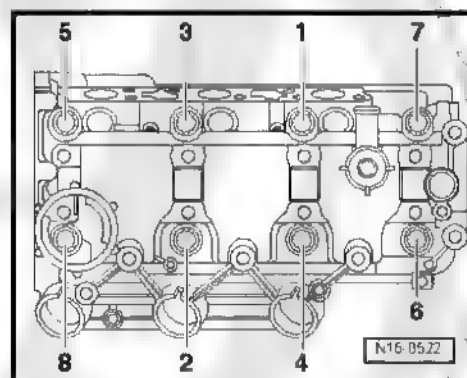


### Note

- ◆ *Only remove the new engine cylinder head sealing gasket from the package immediately before installation.*
- ◆ *Handle the new gasket as carefully as possible. Damages can cause leaks.*
- Put clean pieces of cloth in the cylinders, to prevent the entrance of impurities and polishing residues between the cylinders and the pistons.
- Prevent the entrance of impurities and polishing residues in the cooling system.
- Carefully clean cylinder head and engine block contact surfaces. Make sure grooves or burrs are not formed (should sandpaper be used, the grit should not be inferior to 100).
- Carefully remove the polishing and sandpaper residues, as well as the pieces of cloth.
- Place cylinder 1 piston in TDC and slightly return the crankshaft.
- Install the new cylinder head gasket in the centering guides-A-. The marking (part number) -B- should be visible.
- Install the engine cylinder head, manually place the 8 screws.



- Tighten the engine head screws in the shown tightening sequence:
- Tighten screws to 30 Nm.
- Then tighten 90° with a hard wrench.
- Then tighten another 90°.



### Note

*When the camshaft is moved, the crankshaft cannot be in TDC. Danger of damage to the valves/pistons.*

- Regulate valve timing ➔ [page 32](#).
- The remaining assembly operation is carried out in the inverted order of the removal sequence, paying attention to the following:
- Replenish cooling system ➔ [page 66](#).

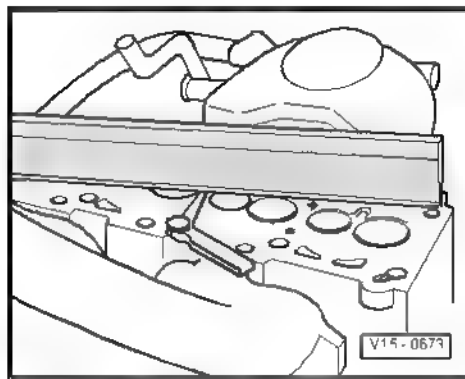


Check the cylinder head for warping



Note

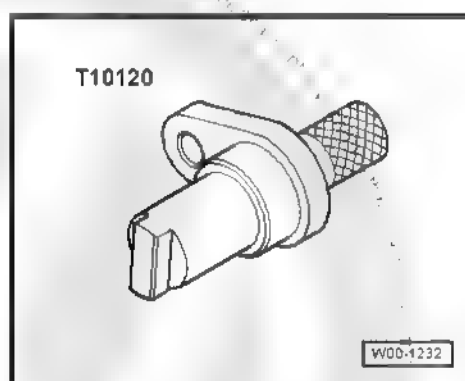
Maximum warping allowed: 0.05 mm



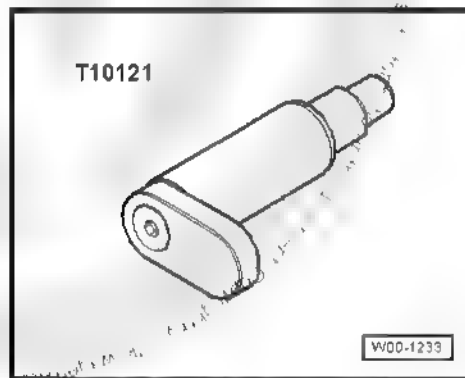
### 1.3 Valve timing - check

Special tools and workshop equipment required

◆ Locating pin - T10120-

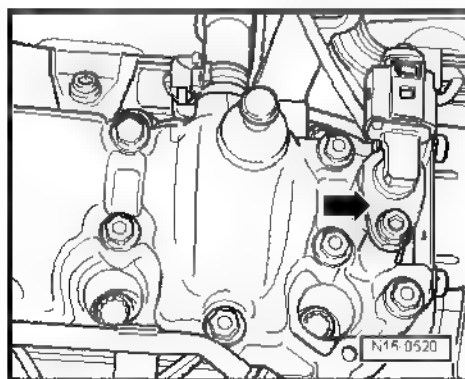


◆ Locating pin - T10121-



Test sequence

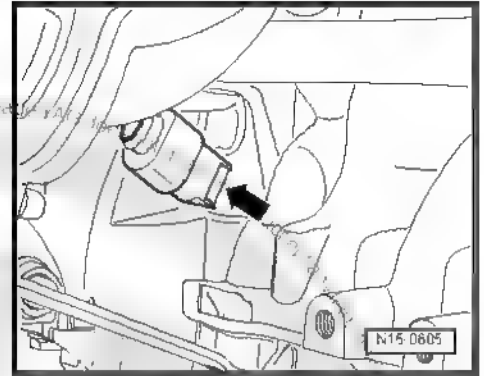
– Remove the Hall Sensor - G40- -arrow-



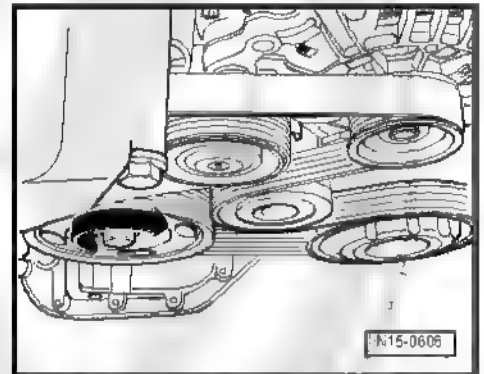




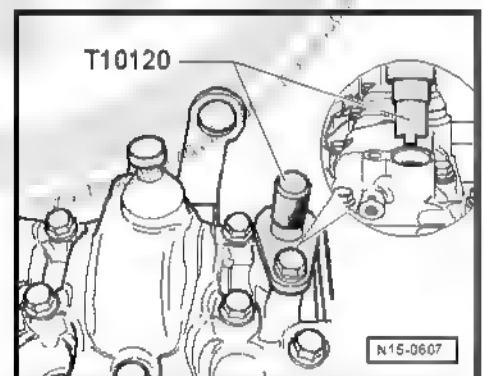
- Remove the Engine speed sensor - G28- -arrow-.



- Turn the crankshaft by the pulley's fastening screw in the direction of the engine's rotation, until the slot of the camshaft is visible in hole for the Hall Sensor - G40- .



- The Positioner - T10120- has to enter the camshaft easily.



- Lock the crankshaft, placing the Positioner - T10121- in the hole of the flywheel.



#### Note

*If the Positioner - T10121- does not enter easily, remove the Positioner - T10120- from the camshaft. Turn the crankshaft in the direction of the engine's rotation (360°) and repeat the operation.*

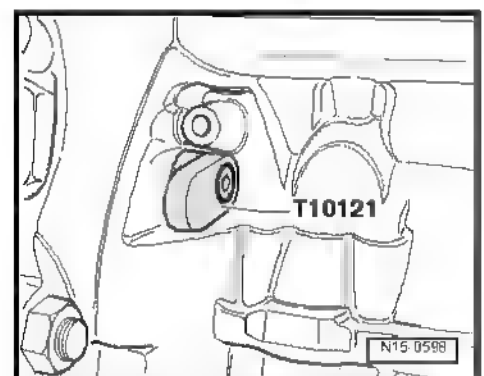
In case it is not position to place the two fastening pins:

- Synchronize the valve timing ➔ [page 35](#) .

In case it is position to place the two fastening pins:

- Remove the two fastening pins from the holes and install the two sensors again.

The rest of the installation is processed in the reverse order from removal.

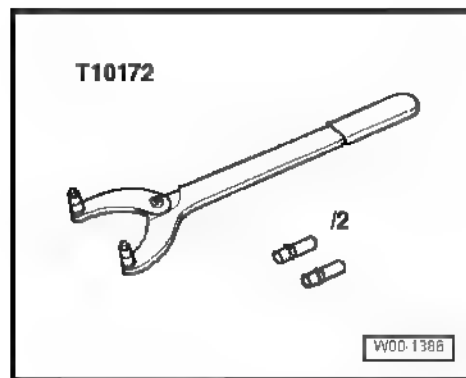


## 1.4 Roller chains - remove and install

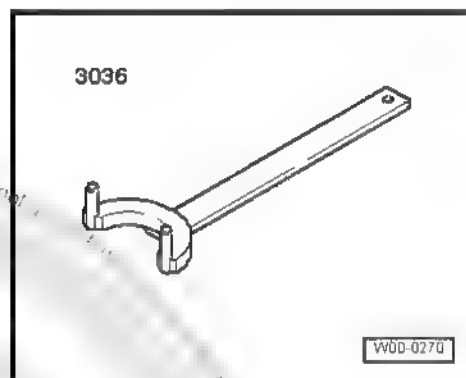
Special tools and workshop equipment required



◆ Wrench - T10172-

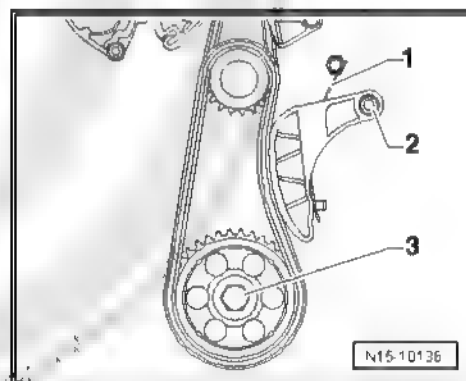


◆ Special wrench - 3036-

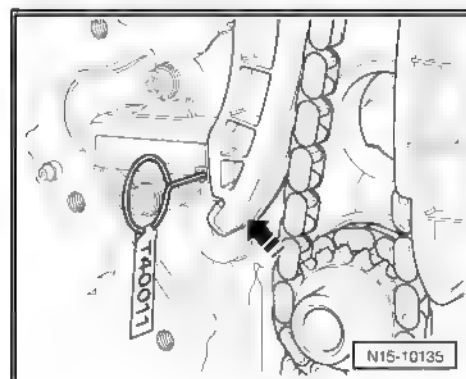


### 1.4.1 Removal

- Remove the camshaft control box ⇒ [page 15](#) .
- Fasten the camshaft and the crankshaft ⇒ [page 32](#) .
- Remove the torsion spring -1- with a screwdriver of the threaded head screw.
- Remove fastening screw -2- and remove the chain stretcher.
- Loosen the fastening bolt -3-. To immobilize the gear use the Wrench - T10172- .
- Jointly remove the gear from the oil pump, the roller chain and the primary gear.

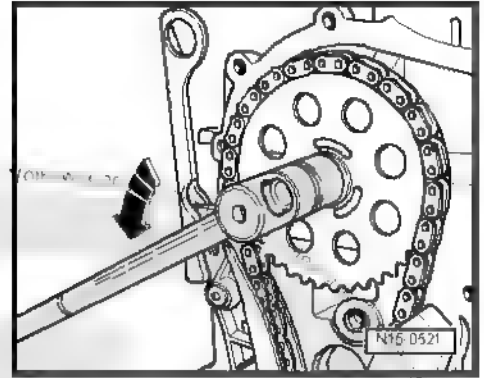


- Manually press the tensioning chute -towards the arrow- and lock the chain stretcher with the Pin - T40011-





- Loosen the fastening screw. For such, use the Special wrench - 3036- .
- Remove the tensioning chute and the sliding chute from the guide pins, pulling it forwards.
- Remove the roller chain from the gears.



### 1.4.2 Installation

- Pass the roller chain in the gear of the camshaft and in the gear of the crankshaft.
- Pull the tensioning chute and the sliding chute forwards in the guide pins.
- Put the gear of the camshaft with a new fastening screw.

Tighten the fastening screws to 20 Nm + 90°

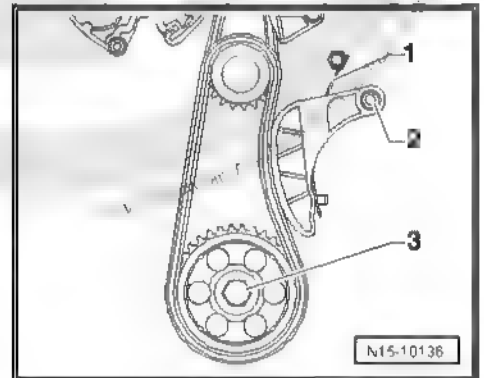
- For such, use the Special wrench - 3036- .
- Put the roller chain of the oil pump together with the two chain gears.
- Screw the oil pump gear with a new fastening screw.

Tighten the fastening screws to -3- 20 Nm + 90°

- Assemble the stretcher of the actuation chain of the oil pump.

Tightening torque of the fastening screw -2- of the chain stretcher: 15 Nm

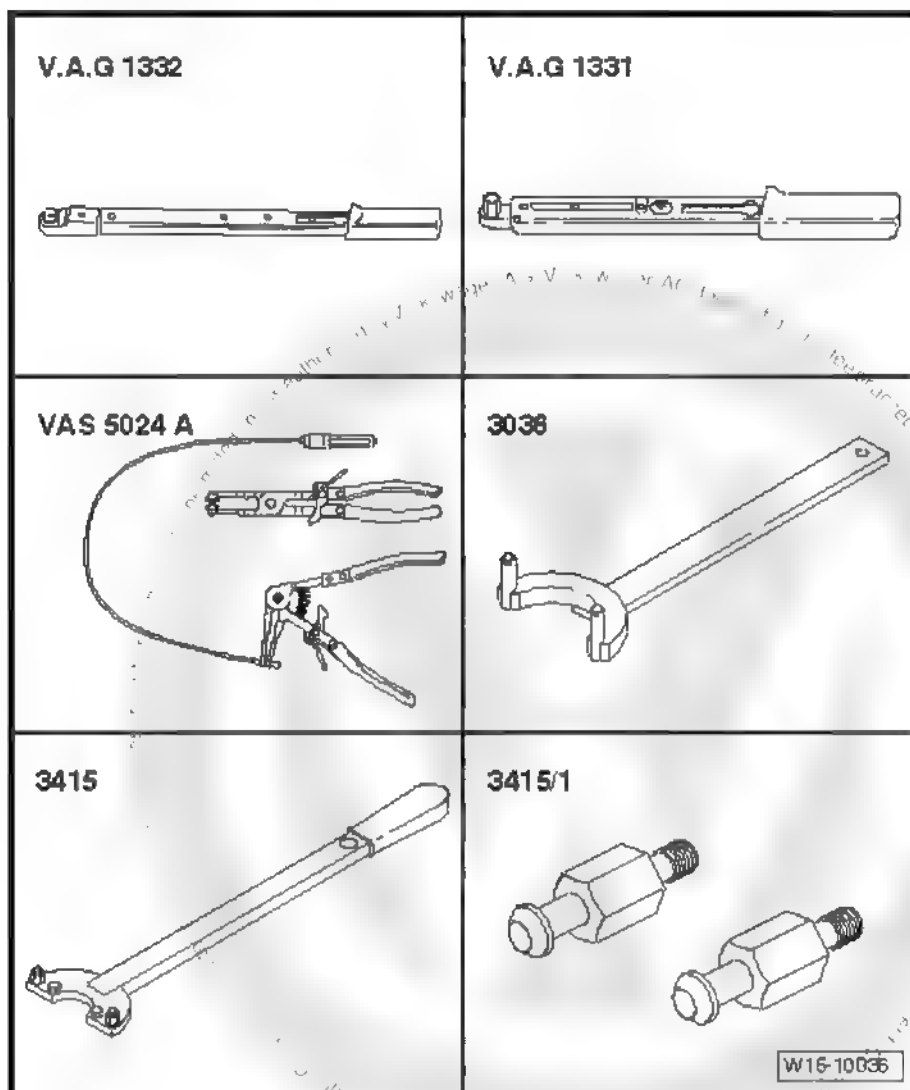
- For such, use the Wrench - T10172- .
- Install the torsion spring -1- with a screwdriver of the threaded head screw.
- Adjust valve timing ⇒ [page 35](#) .
- Install the command box ⇒ [page 15](#) .



### 1.5 Valve timing - adjust



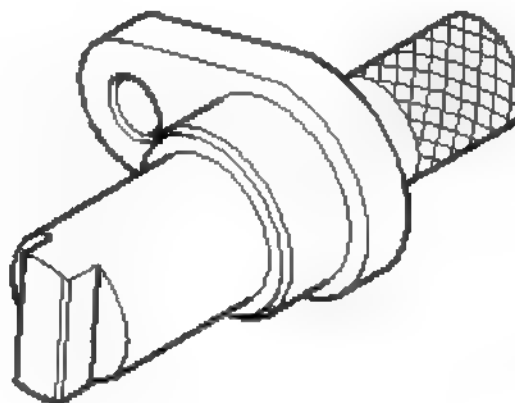
Special tools and workshop  
equipment required



- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Standard-type clamp pliers - VAS 5024A- or Standard-type clamp pliers - VW 5162-
- ◆ Special wrench - 3036-
- ◆ Wrench - 3415-
- ◆ Pins - 3415/1-



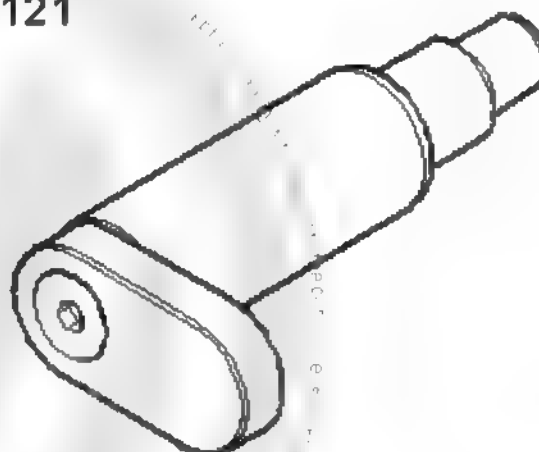
**T10120**



W00-1232

◆ Locating pin - T10120-

**T10121**



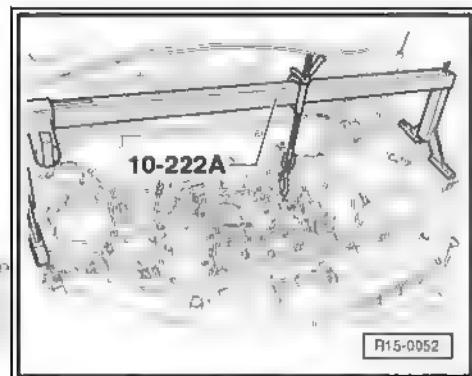
W00-1233

◆ Locating pin T10121-



### Operation sequence

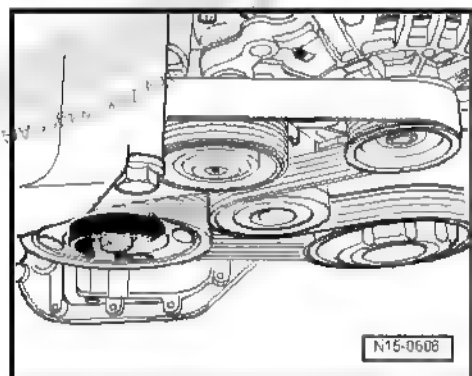
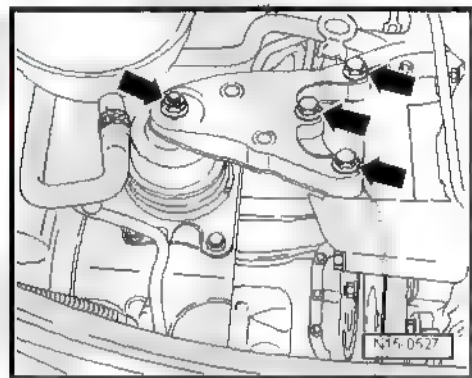
- Install the Support - VW 061- or Support - 10-222A- with Hooks - 10-222A/10- , as indicated.
- Remove the Poly-V belt ➔ [page 14](#) .



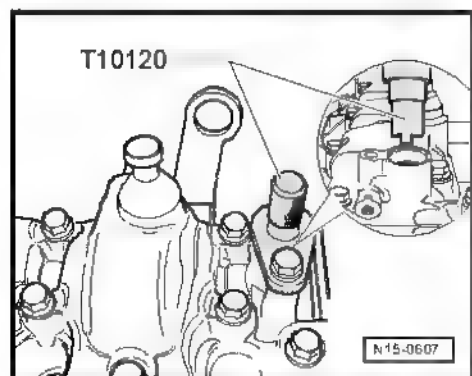
- Remove the support of the prower-drive group, engine -arrows-.

Remove or turn off the following components:

- ◆ Water pump pulley
- ◆ Pulley of the tensioning element
- ◆ Tension roller
- ◆ Alternator - C-
- ◆ Air conditioner compressor
- ◆ Crankshaft pulley
- ◆ Oil dipstick
- ◆ Crankcase
- ◆ Operation by chain from the command box
- Install the fastening screw of the pulley of the crankshaft up to the stop in the crankshaft.
- Turn the crankshaft by the pulley's fastening screw in the direction of the engine's rotation, until the slot of the camshaft is visible in hole for the Hall Sensor - G40-

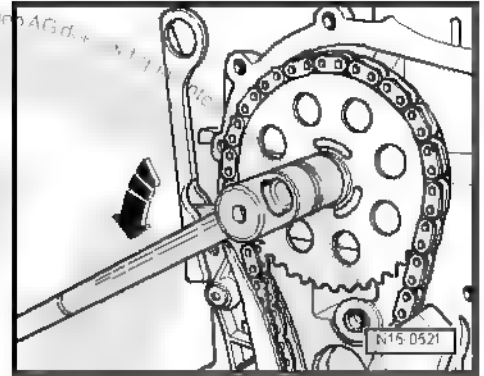


- The Positioner - T10120- has to enter the camshaft easily.

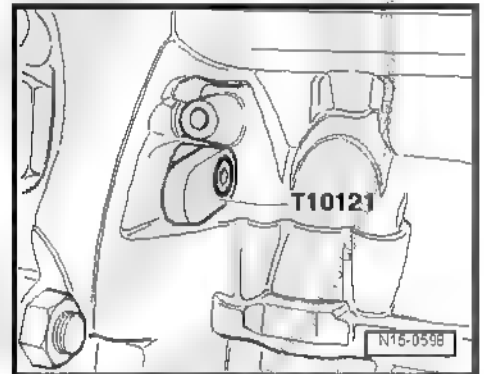




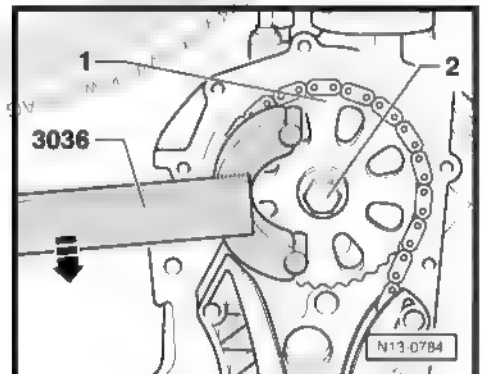
- Loosen camshaft gear fastening screw (use the Special Wrench - 3036- ) .



- Turn the crankshaft by the fastening screw of the pulley in the direction of rotation of the engine, until it is possible to insert the Positioner - T10121- in the flywheel.



- Tighten the new camshaft gear -1- fastening bolt -2- to 20 Nm (use the Special wrench - 3036- ).
- Finally, turn the screw another 90° with a hard wrench.
- Remove the two fastening pins from the camshaft and the flywheel.
- Turn the crankshaft two turn towards the rotation of the engine and check the valve timing again [⇒ page 32](#) .

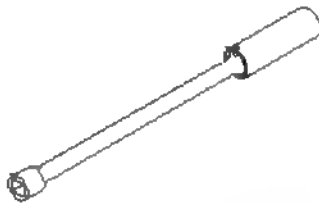


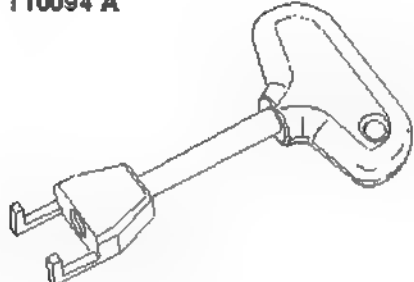


The rest of the installation is processed in the reverse order from removal.

## 1.6 Compression - check



Special tools and workshop  
equipment required

<b>3122 B</b> 	<b>V.A.G 1331</b> 
<b>V.A.G 1763</b> 	<b>T10094 A</b> 
	<b>W15-10069</b>

- Spark plug wrench - 3122B-
- Torque wrench - 5 to 50 Nm (  $\frac{1}{2}$ " drive) - VAG 1331-
- Cylinder compression gauge - VAG 1763-
- Puller - T10094A-

Test conditions

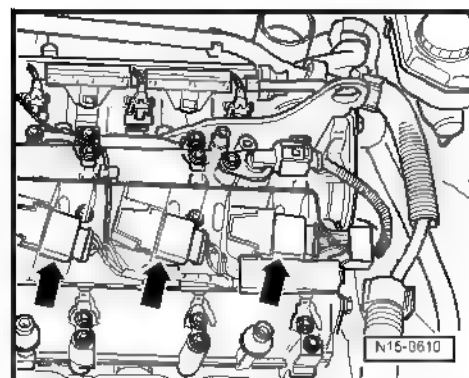
- The temperature of the engine oil has to be at least 30 °C.





### Operation sequence

- Disconnect the 4-pole connectors from the Ignition coil 1 with final power stage - N70- , Ignition coil 2 with final power stage - N127- and Ignition coil 3 with final power stage - N291- -arrows-.
- Remove all ignition coils with the Puller - T10094A- .
- Remove the Spark plugs - Q- with the Spark plug wrench - 3122B- .
- Remove fuse 44 from the injecting valves
- Check compression with the Cylinder compression gauge - VAG 1763- .



### Note

*The handling of the testing device is described in the respective operation instructions.*

- Actuate the starter motor until any pressure increase ceases being indicated by the testing device.

### Compression values:

Engine prefix		BMD/CHFB/ CHFA
Cylinder compression	bar	10.0 a 15.0
Wear limit	bar	7.0
Maximum compression difference between cylinders	bar	3.00

- Install the Spark plugs - Q- with the Spark plug socket - 3122B- and tighten to 30 Nm.



## 2 Camshaft mechanism - repair

Camshaft - check axial clearance ➔ [page 44](#) .

Valve seat - trim ➔ [page 45](#) .

Valve guides - check ➔ [page 48](#) .

Valve rod sealant - replacement ➔ [page 49](#) .

### 2.1 Camshaft mechanism - repair



#### Note

*Engine cylinder head with cracks between valve seats or between the seat of a valve and the thread of the Sparking plugs - Q- may continue to be used without reduction of its life cycle, as long as the cracks are not wider than 0.5 mm or only down to the 4th turn of the Sparking plug - Q- thread.*

#### 1 - Cylinder head cover

- ☐ The seal surface can not be ground.
- ☐ With integrated camshaft bearings.
- ☐ Remove the residue of the old joint.
- ☐ Before installation, apply a layer of Sealing putty for engines - AMV 188 001 02- .
- ☐ For installation, place in the vertical position, from top down, with the adjustment pins in holes of the cylinder head of the engine.

#### 2 - 6 Nm + 90°

- ☐ Renew after each removal.
- ☐ Tighten from inside to outside.

#### 3 - Camshaft

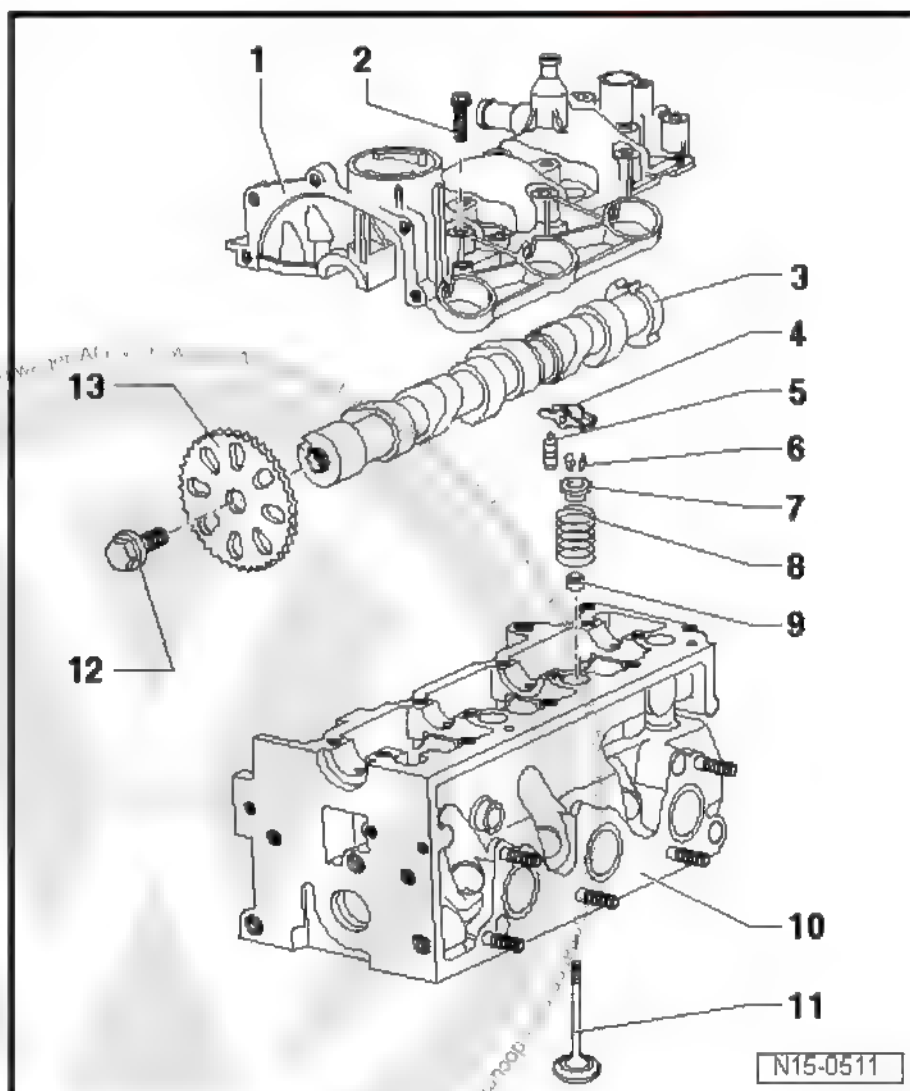
- ☐ Check axial clearance ➔ [page 44](#) .
- ☐ Check radial clearance with Plastigage, Wear limit of 0.1 mm.
- ☐ Eccentricity max. 0.05 mm.

#### 4 - Roller rockers

- ☐ Check the mobility of the bearing rollers.
- ☐ Lubricate sliding surface
- ☐ For installation, engage in the support element with the safety clamp.

#### 5 - Support element

- ☐ Do not change positions





- ☐ With valve clearance hydraulic offsetting.

#### 6 - Keys

#### 7 - Valve spring plate

#### 8 - Valve spring

- ☐ With the engine cylinder head removed, use the Compression device - 2037- .
- ☐ With the engine cylinder head installed ➔ [page 49](#) .

#### 9 - Valve stem sealant

- ☐ Replace ➔ [page 49](#) .

#### 10 - Engine cylinder head

- ☐ The sealing surface on the side of the camshaft can not be damaged.
- ☐ Grind valve seats ➔ [page 45](#) .
- ☐ Grind sealing surface on the engine block side ➔ [page 43](#)

#### 11 - Valves

- ☐ Do not grind, they can only be seated.
- ☐ Valve specifications ➔ [page 45](#)

#### 12 - 20 Nm \* 90°

- ☐ Renew after each removal.

#### 13 - Gear

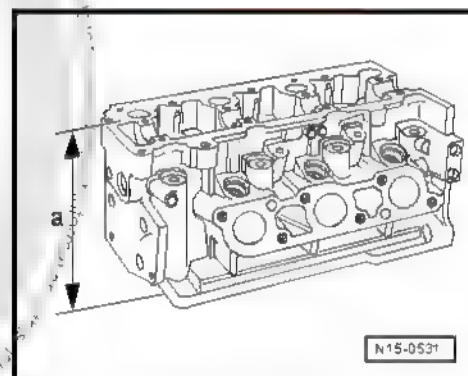
- ☐ Of valve camshaft.
- ☐ Immobilize the gear with the Special wrench - 3036- .

Grind sealing surface on the engine block side



Note

Specifications for the cylinder head grinding: -a- = a least 136.15 mm.

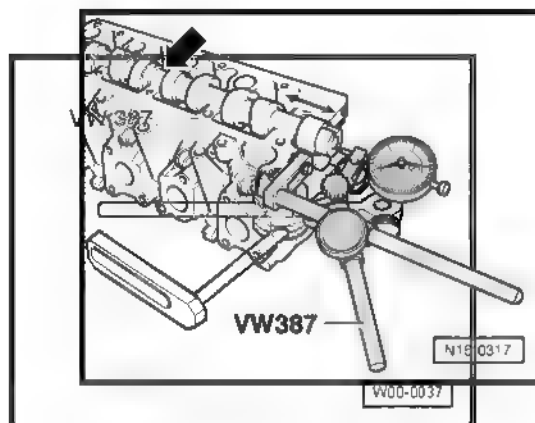




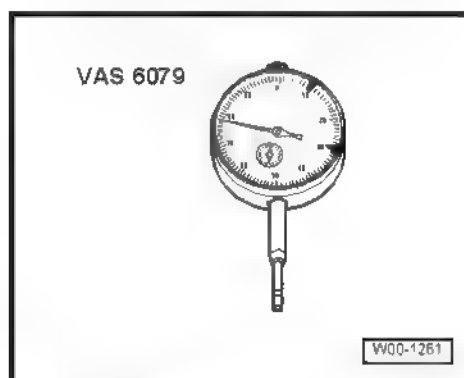
## 2.2 Camshaft - check axial clearance

Special tools and workshop equipment required

- ◆ Mounting bracket - VW 387-



- ◆ Dial gauge - VAS 6079-



### Camshaft - check axial clearance

Measure with support elements and camshaft cover removed.

- Make pressure on the central bearing of the camshaft -arrow-, and check the axial clearance moving it.

Wear limit: max. 0.20 mm.

Camshaft identification, valve timing

Code between intake and exhaust cams in cylinder 1 - BMD/CHFB/CHFA Engine	
Cylinder 1	03DF

Distribution times for 1-mm valve clearance

BMD/CHFB/CHFA engine

		Intake valve	Exhaust valve
Opens after	TDC	11° 48'	-----
Closes after	BDC	27° 26'	-----
Opens before	BDC	-----	36° 28'
Closes before	TDC	-----	1° 46'



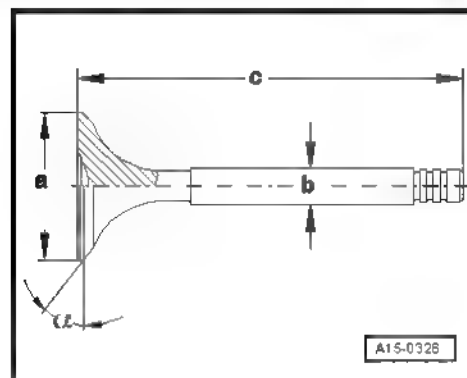
## Valve specifications



### Note

Valves cannot be ground. They can only be seated

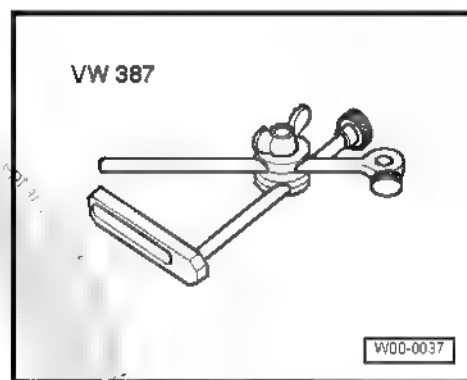
Dimensions		Intake valve	Exhaust valve
$\varnothing a$	mm	34.5	28.0
$\varnothing b$	mm	5.98	5.96
c	mm	99.25	99.25
$\alpha$	$^{\circ}$	45	45



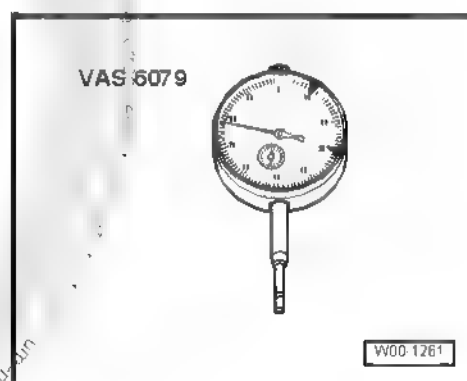
## 2.3 Valve seat - trim

### Special tools and workshop equipment required

- ◆ Universal indicating clock - fastening - MP3-447- or Support - VW 387-



- ◆ Dial gauge - VAS 6079-



- ◆ Micrometer or vernier caliper
- ◆ NAC cutter for rework of valve seats
- ◆ Grinding paste



#### Note

- ◆ *When repairing engines whose valves present leaks, grinding or replacing the valves and their seats is not enough. It is also necessary to inspect the valve guides to check for wear, especially in engines with high mileage. In case the wear limit is already exceeded, replace the cylinder head.*
- ◆ *Do not grind the valve seats. Only the seating of the valve with the corresponding seat is admitted, using the grinding paste to obtain proper contact. Before starting, calculate the sizing of the maximum admissible rework. In case such sizing is exceeded, the proper operation of the valve can no longer be guaranteed and it will be necessary to replace the cylinder head.*

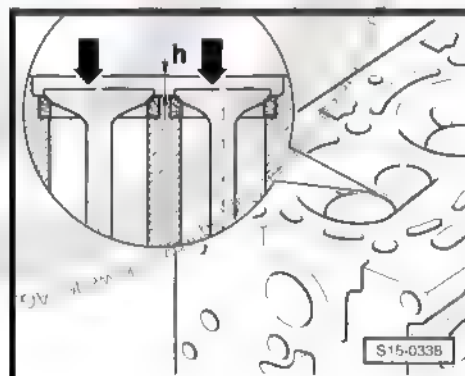
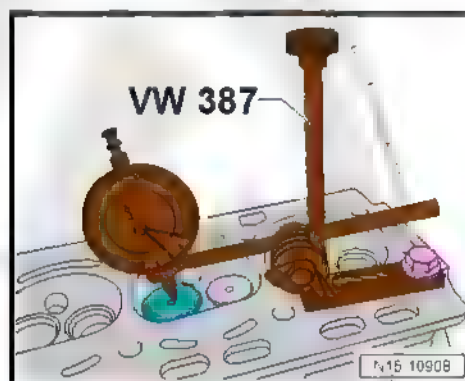
#### Calculating maximum trim

- Install valve and firmly press it against the valve seat.



#### Note

- ◆ *If the valve is replaced in the repair, use the new valve for measurement.*
  - ◆ *If a new valve is not used, the seat of the valve must be rigorously cleaned*
- With a screw, fasten the clock support onto the cylinder head.
- 
- Measure the distance -h- from the lower edge of the cylinder head to the lower edge of the valve. Measure in the region next to slot of the central valves-~~arrows~~.





- Check the length of the valve -c- → [page 45](#)



#### Note

Check the length -c- in the area next to the central slot of the disc of the valve.

- Calculate the sizing of the maximum rework from the measured distances -c- and -h- and the maximum dimension.

Maximum dimension for both valves. 103.7 mm

Maximum admissible rework dimension =  $103.7 - (c + h)$ .

Example:

Maximum dimension for both valves	103.7 mm
- (Valve length -c- + measured distance -h-)	(99.2 + mm 4.35)
= sizing of the maximum admissible rework <sup>6)</sup>	0.15 mm

6) The sizing of the maximum admissible rework is shown in the figures referring to the rework of the valve seats ("b" dimension).

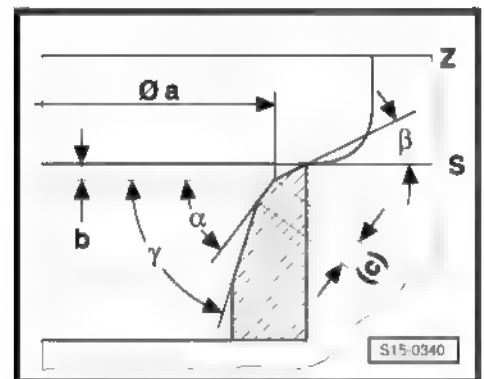


#### Note

If the sizing of the maximum admissible rework is 0 mm, measure again with a new valve, if necessary. If the sizing is 0 mm again, change the cylinder head.

#### Grind the intake valve seats

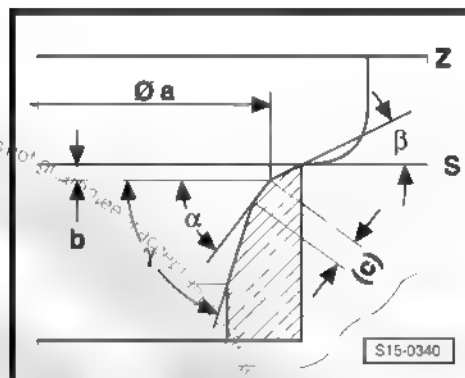
- a =  $\varnothing$  33.4 mm
- b = sizing of the maximum admissible rework
- c = max. 1.5...1.7 mm
- Z = Lower cylinder head edge
- $\alpha$  = valve seat angle of  $45^\circ$
- $\beta$  = angle of  $30^\circ$  for the correction of the upper part
- $\gamma$  = angle of  $60^\circ$  for the correction of the lower part
- S Base area for the combustion chamber





### Grind the exhaust valve seats

- a =  $\varnothing$  27.1 mm
- b = sizing of the maximum admissible rework
- c = max 1.6...10.8 mm
- Z = Lower cylinder head edge
- $\alpha$  = valve seat angle of  $45^\circ$
- $\beta$  = angle of  $30^\circ$  for the correction of the upper part
- $\gamma$  = angle of  $60^\circ$  for the correction of the lower part
- S Base area for the combustion chamber



### Procedure

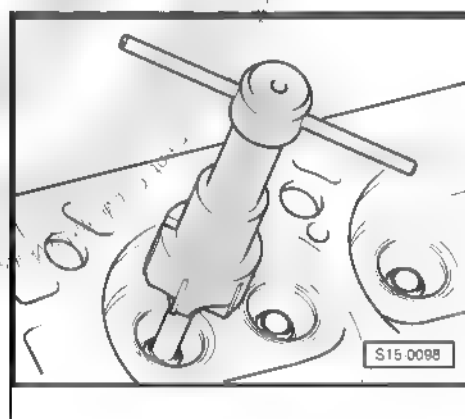
The rework can be done manually, as long as the following conditions are met:

- The wear limit of the guides of the valves can not exceed the maximum admissible dimension.
- The NAC cutter with metal carbonate tip should be used (min. 90 HRC hardness).
- Cut using slight pressure, so as to guarantee the uniform removal of the fillings from the whole work surface.

### Rework at the valve seat with NAC cutter

- Place the cylinder head on a felt base and fast to prevent it from moving.
- Match the mandrel and the diameter of the valve guide.

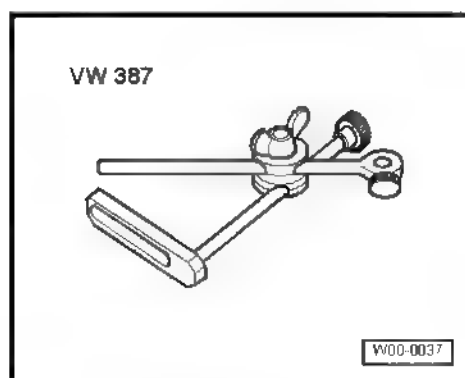
Valve guide	Mandrel (mm)
Intake valve	6.0 - 0.01
Exhaust valve	6.0 - 0.01



## 2.4 Valve guides - check

Special tools and workshop equipment required

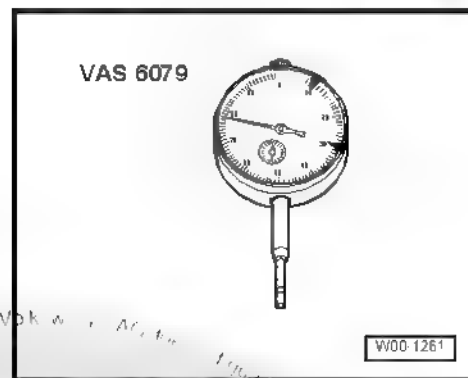
- ◆ Mounting bracket - VW 387-







◆ Dial gauge - VAS 6079-

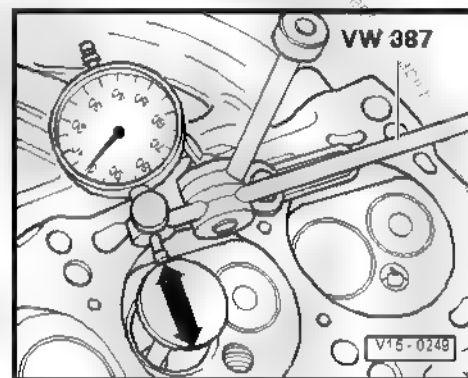


**Test sequence**

- Place a new valve on the guide. The end of the valve should be aligned with guide. Due to the various valve guide diameters, it is recommended that only one intake valve be used on the intake guide and one exhaust valve on the escape guide.
- Measure tilting gap -arrow-. Wear limit: 0.8 mm.

If the clearance is exceeded:

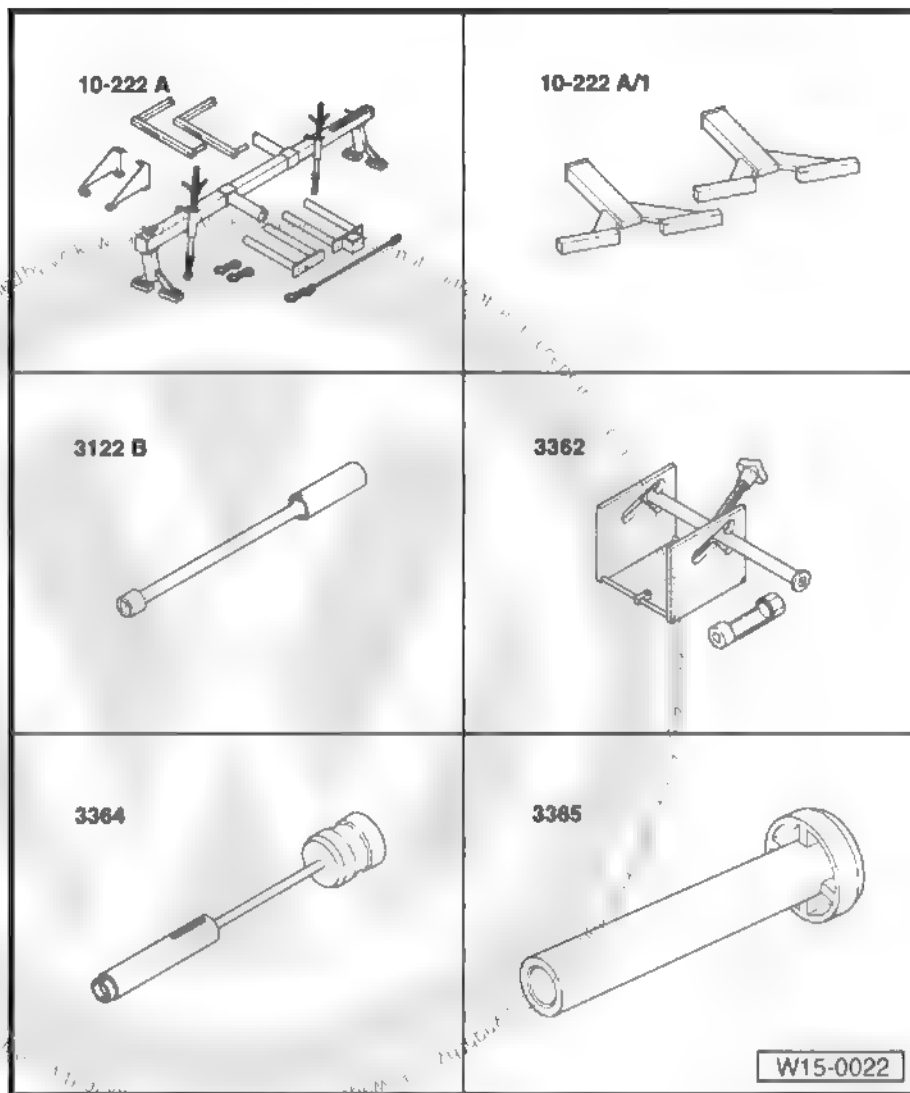
- Replace engine cylinder head.



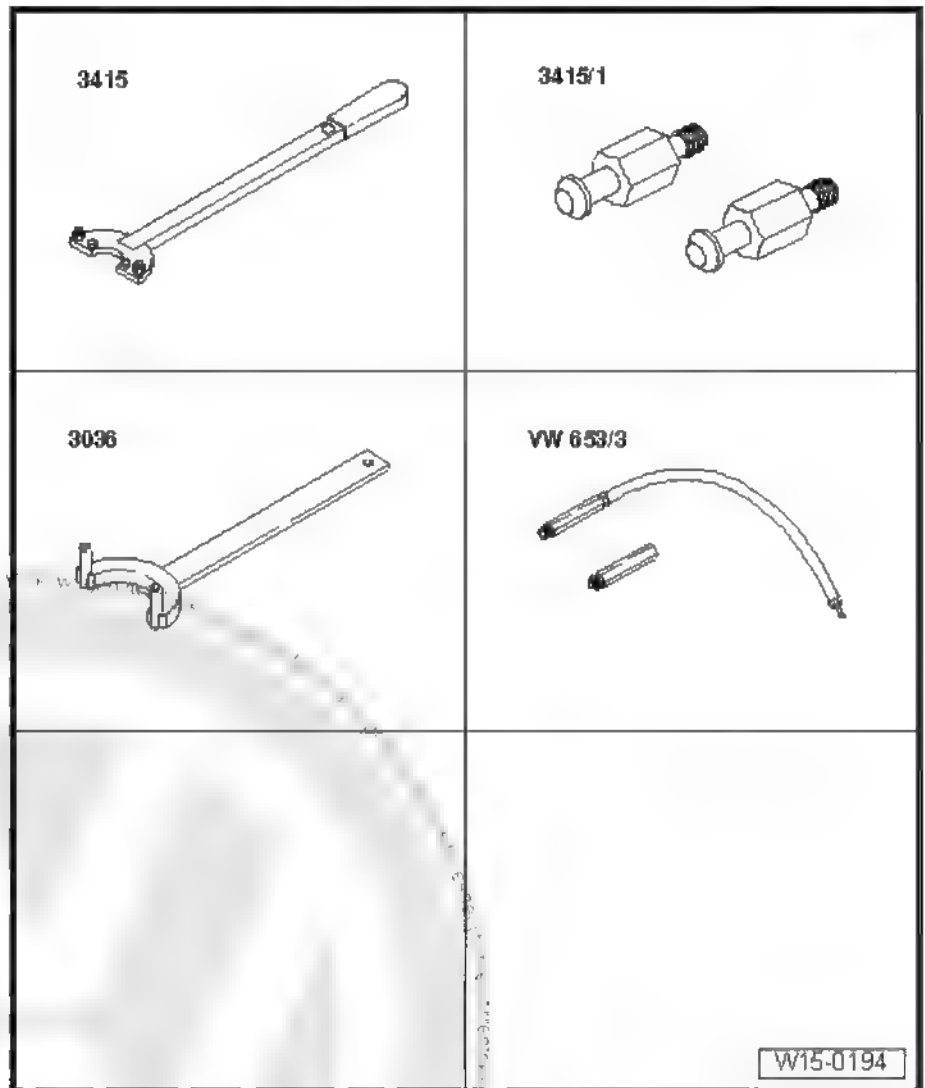
## 2.5 Valve rod sealant - replacement



Special tools and workshop  
equipment required



- ◆ Support - VW 061- or Support - 10-222A-
- ◆ Support - 10 - 222 A /1-
- ◆ Spark plug wrench - 3122B-
- ◆ Valve springs compressor - 3362- with the Press - 3362/1-
- ◆ Seal fitter - 3365-



- ◆ Wrench - 3415-
- ◆ Pins - 3415/1-
- ◆ Special wrench - 3036-
- ◆ Flexible tube - VW 653/2A- or Flexible tube - VW 653/3-

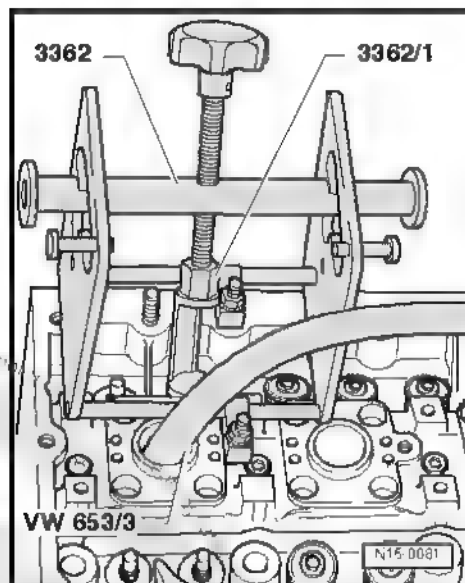
### 2.5.1 Removal

(with the cylinder head installed)

- Remove cylinder head cover → [page 26](#)
- Remove roller rockers and place them on a clean surface.  
Make sure the roller rockers are not changed.
- Remove the spark plugs with the spark plug socket - 3122B- .
- Place the piston of the respective cylinder in the "Lower Dead Centre" position.



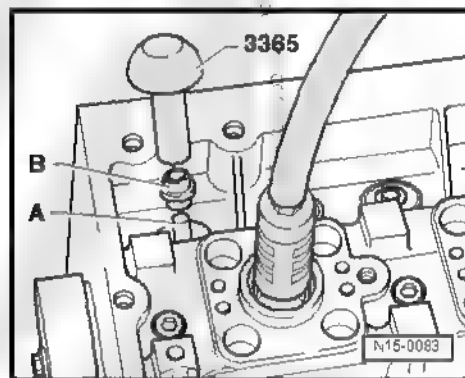
- Install the Valves springs compressor - 3362- with the -3362/1- .
- Install the Flexible tube - VW 653/2A- or Flexible tube - VW 653/3- to the spark plug thread.
- Connect the pressure tube to the compressed air with, at least, 6 bar of positive pressure and remove the springs from the valves.
- Remove the valve stem seal with the Impact extractor - 3364- .



## 2.5.2 Installation

- Install the plastic bushing supplied in the respective valve stem. Thus damages to the valve stem's sealant are prevented.
- Install the new stem seal on the Sealant fitter - 3365- .
- Lubricate the sealing lip of the sealant of the valve stem and carefully install in the valve guide.
- Install cylinder head cover => [page 26](#) .

The rest of the installation is processed in the reverse order from removal.





## 17 – – Lubrication

### 1 Lubrication system components



#### Note

*Oil level shall not exceed the max. mark. - risk of damage to the catalytic converter. See ➔ [page 55](#)*

Engine oil (supply quantities, engine oil specification)  
➔ [page 53](#).

Oil pan - remove and install ➔ [page 57](#).

Oil pressure and the Oil pressure switch - F1- - check  
➔ [page 59](#).

#### 1.1 Engine oil

Oil supply capacities

With a 2.85-liter oil filter.

Engine oil specification

Use oils with high lubrication power as per Lubricating oil for engines - VW 502 00- specification.

#### 1.2 Lubrication system - general assembly overview



## 1 - Oil pressure switch - F1-

- ☐ 0.3...0.7 bar
- ☐ 25 Nm

## 2 - Guide bushing

## 3 - Oil pump

- ☐ Replace complete only.
- ☐ Lubricate before assembly.

## 4 - 25 Nm

## 5 - Crankcase

- ☐ Remove and install with liquid gasket ⇒ [page 57](#) .
- ☐ Clean the sealing surfaces before installation.
- ☐ Install with Silicone sealant - D 176 404 A2 ou A3- ⇒ [page 57](#) .

## 6 - 15 Nm

## 7 - Seal

- ☐ Renew after each removal.

## 8 - Oil drain plug

- ☐ 30 Nm
- ☐ With sealing ring.
- ☐ Replace the sealing ring upon each removal.

## 9 - 8 Nm

## 10 - Cover

## 11 - 20 Nm + 90°

- ☐ Renew after each removal.

## 12 - Gear

- ☐ From roller chain ⇒ [Item 13 \(page 54\)](#) .
- ☐ After installing, adjust the valve timing ⇒ [page 35](#) .

## 13 - Roller chain

- ☐ Mark rotation direction before removal (installation position).

## 14 - Chain stretcher with tensioning chute

- ☐ From roller chain ⇒ [Item 13 \(page 54\)](#) .

## 15 - 15 Nm

## 16 - Gear of the oil pump

- ☐ From roller chain ⇒ [Item 13 \(page 54\)](#) .

## 17 - Supporting bushing

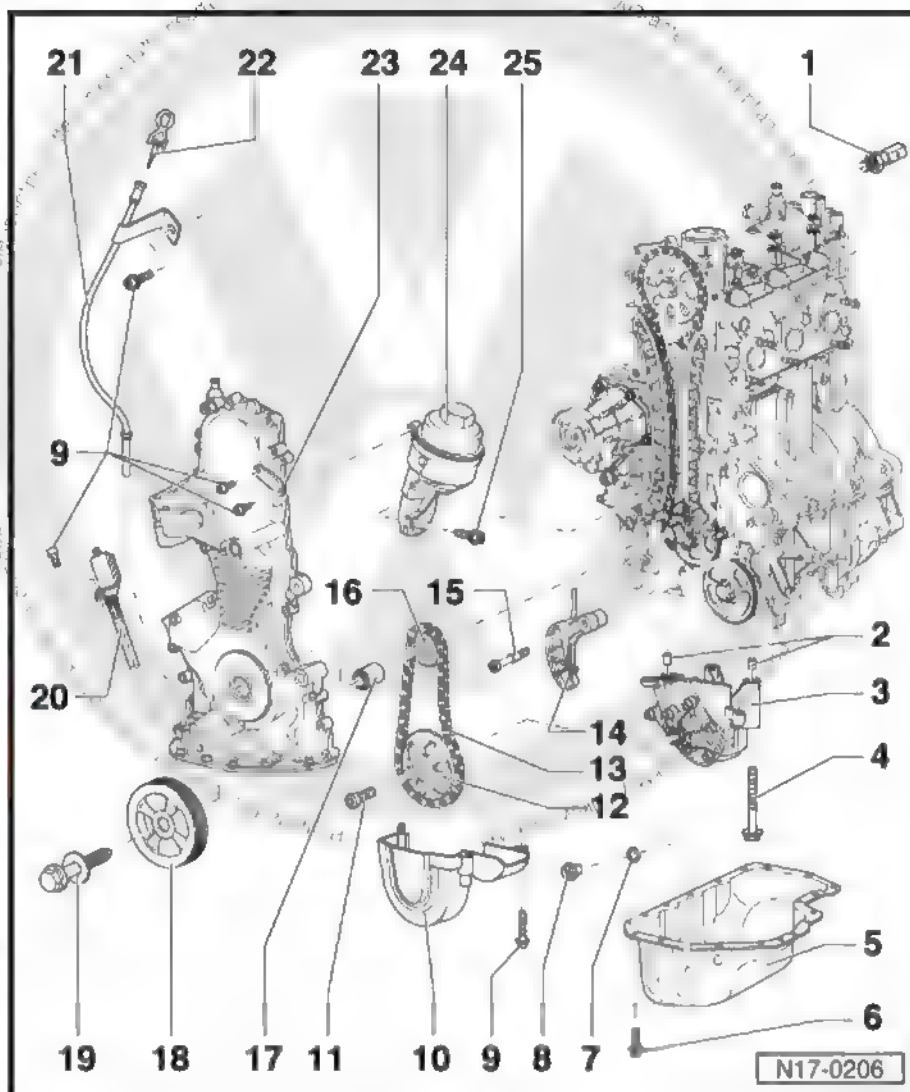
- ☐ With sealing ring
- ☐ Replace the sealing ring upon each removal.

## 18 - Crankshaft pulley

- ☐ Remove and install of Poly-V belt ⇒ [page 14](#) .

## 19 - 90 Nm + 90°

- ☐ Renew after each removal.





- ☐ Lubricate prior to fitting.
- ☐ Immobilize the crankshaft pulley with the Spanner - 3415- .
- ☐ The angular torque can be measured with a wrench, e.g. Hazet 6690.

#### 20 - Oil level and temperature sensor - G266-

- ☐ Not applicable.

#### 21 - Guide tube

#### 22 - Oil dipstick

- ☐ Oil level shall not exceed the max. mark. !
- ☐ Markings ⇒ [page 55](#)

#### 23 - Mounting bracket

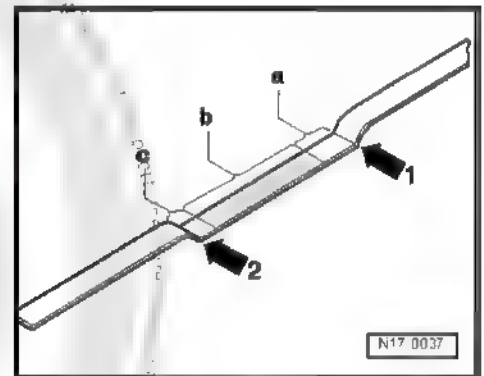
#### 24 - Oil filter

- ☐ Assembly overview ⇒ [page 56](#)
- ☐ Remove and install ⇒ [page 56](#)

#### 25 - 24 Nm

#### Marks on the oil dipstick

- 1 - max. marks.
- 2 - min. marks.
- 3 - ~~a~~ - Region between the upper limit of the engraved region and the max. mark: do not refill with oil.
- 4 - ~~b~~ - Level is listed on the engraved area: refill with oil.
- 5 - ~~c~~ - Area between min. mark and lower corner of engraved area: refill up to 0.5 l of oil







### 1.3 Oil filter - assembly overview

**1 - Threaded plug with filtering element support**

- ❑ 25 Nm

**2 - Seal**

- ❑ Renew once removed
- ❑ Supplied with filtering element

**3 - Filtering element**

- ❑ Remove and install  
⇒ [page 56](#)

**4 - Sealing gasket**

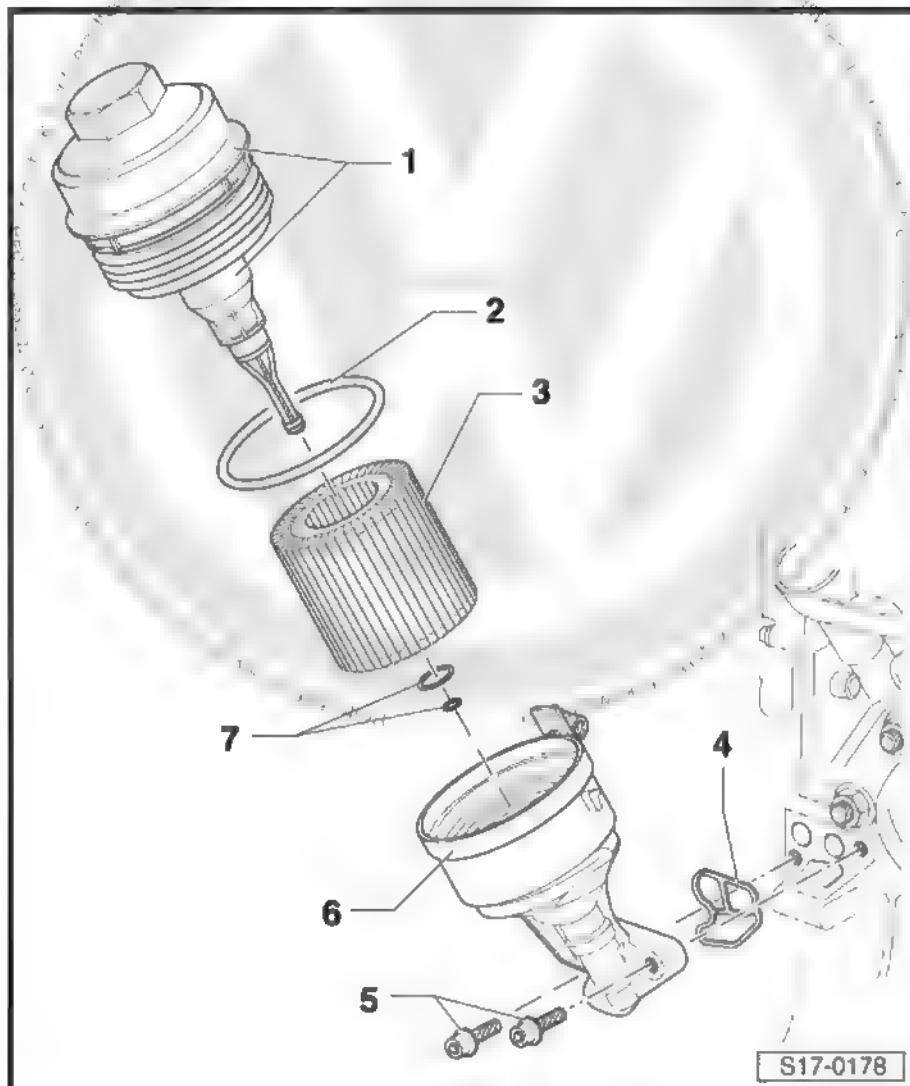
- ❑ Replace if damaged

**5 - 24 Nm**

**6 - Oil filter housing**

**7 - Sealing rings**

- ❑ Replace if damaged



### 1.4 Oil filtering element - remove and install

**Removal**

- Loosen the threaded plug until the cam edge -arrow-, or around 3 turns -a-.

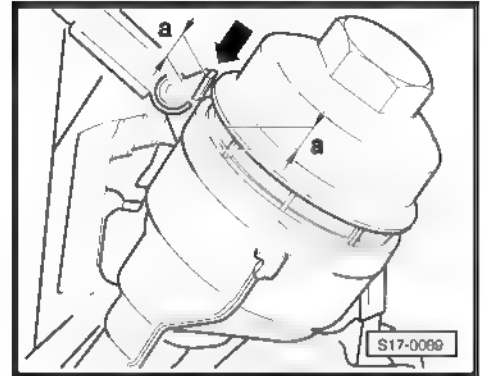


**Caution**

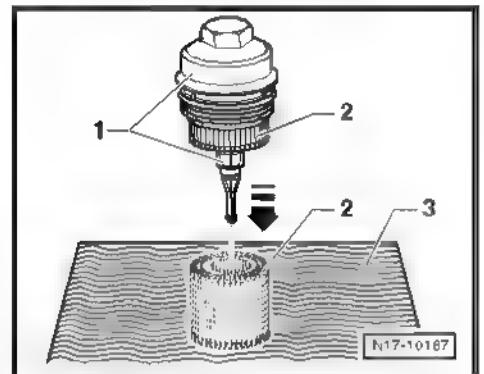
*If the threaded plug is removed immediately, engine oil may leak and damage the Alternator - C- .*



- Wait approximately 1 minute, maintaining the threaded plug in this position
- Remove the threaded plug with filtering element support.



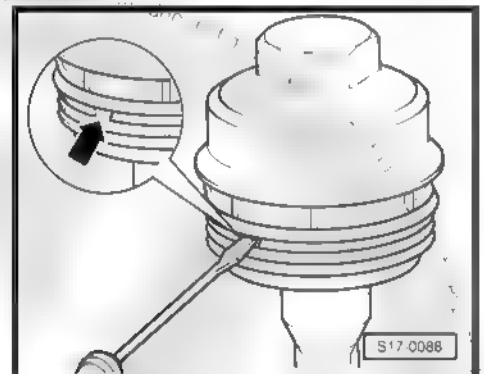
- Gently tap the threaded plug with oil filtering element support -1- against a solid base -3- in the direction of the -arrow-.
- This will loosen the filtering element -2- from the oil filter housing.



- Using a screwdriver, carefully lift the sealing ring from the groove -arrow-.

#### Installation

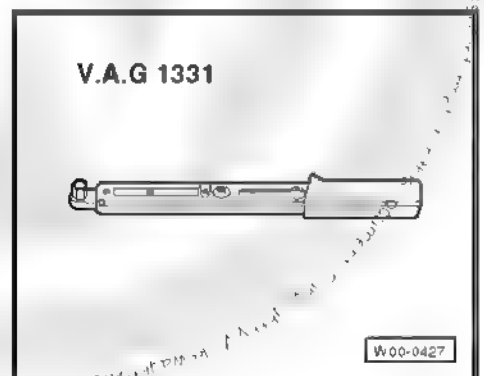
- Install a new sealing ring in the groove.
- Install a new filtering element.
- Tighten the threaded plug with a torque of 25 Nm.



## 1.5 Sump - remove and install

### Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



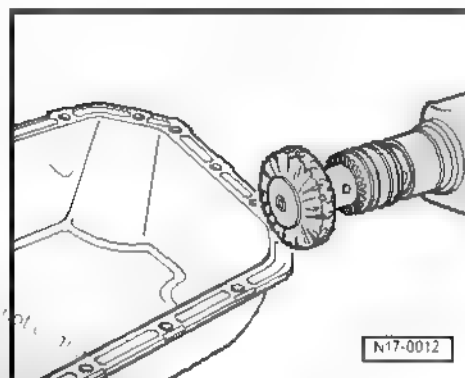
- ◆ Portable drilling machine with plastic brush
- ◆ Flat spatula
- ◆ Silicone sealant for engines - D 176 404 A2 ou A3-



- ◆ Safety goggles

### 1.5.1 Removal

- Drain engine oil
- Remove the fastening nuts of the front exhaust tube in the catalyzer and the sustaining handle in the transmission
- Move away the front tube
- Remove the crankcase fastening screws
- Remove oil pan. If necessary, tap it slightly with a rubber hammer to loosen the crankcase.
- Remove the residues of Engine silicone sealant for engines - D 176 404 A2 ou A3- from the engine block with a flat spatula.
- Remove the residues from Engine silicone sealant - D 176 404 A2 ou A3- from the crankcase with a portable drill and a plastic brush (wear goggles).
- Clean the sealing surfaces. They should be free from lubricating oil.



### 1.5.2 Installation



#### Note

- ◆ *Observe the use-by date for the Engine silicone sealant - D 176 404 A2 ou A3-.*
- ◆ *Oil crankcase must be assembled within 5 minutes from the application of the Silicone sealant for engines - D 176 404 A2 ou A3-.*
- ◆ *The crankcase is more easily and more safely installed if M6 threaded screws are placed to serve as guide in two points of the flange of the engine block.*



- Cut the cartridge nozzle at the foremost mark (nozzle diameter: approx. 3 mm)
- Apply the Engine silicone sealant - D 176 404 A2 ou A3- , as shown, onto clean sealing surface of the crankcase. The Engine silicone sealant - D 176 404 A2 ou A3- cord must be
  - ◆ 2...3 mm thick
  - ◆ Make the contour around the internal side of the holes of the screws -arrows-

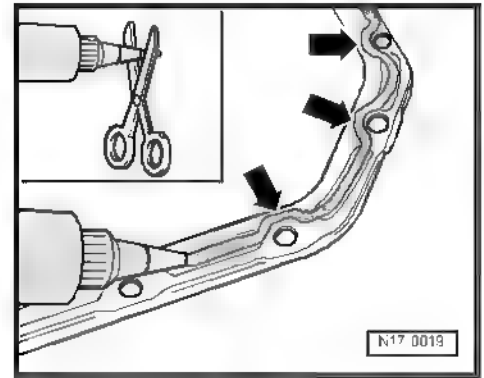
**Note**

*The cord of Engine silicone sealant - D 176 404 A2 ou A3- may not be thicker, otherwise the excess Engine silicone sealant - D 176 404 A2 ou A3- may reach the crankcase and damage the filter in the oil suction tube.*

- Immediately install the crankcase and tighten the screws by the indicated sequence:
- Tighten the crankcase screws to 15 Nm.

**Note**

*Once the oil pan is installed, the Silicone sealant for engines - D 176 404 A2 ou A3- must be allowed to dry for approximately 30 minutes. Only after such time may the engine be filled with engine oil.*

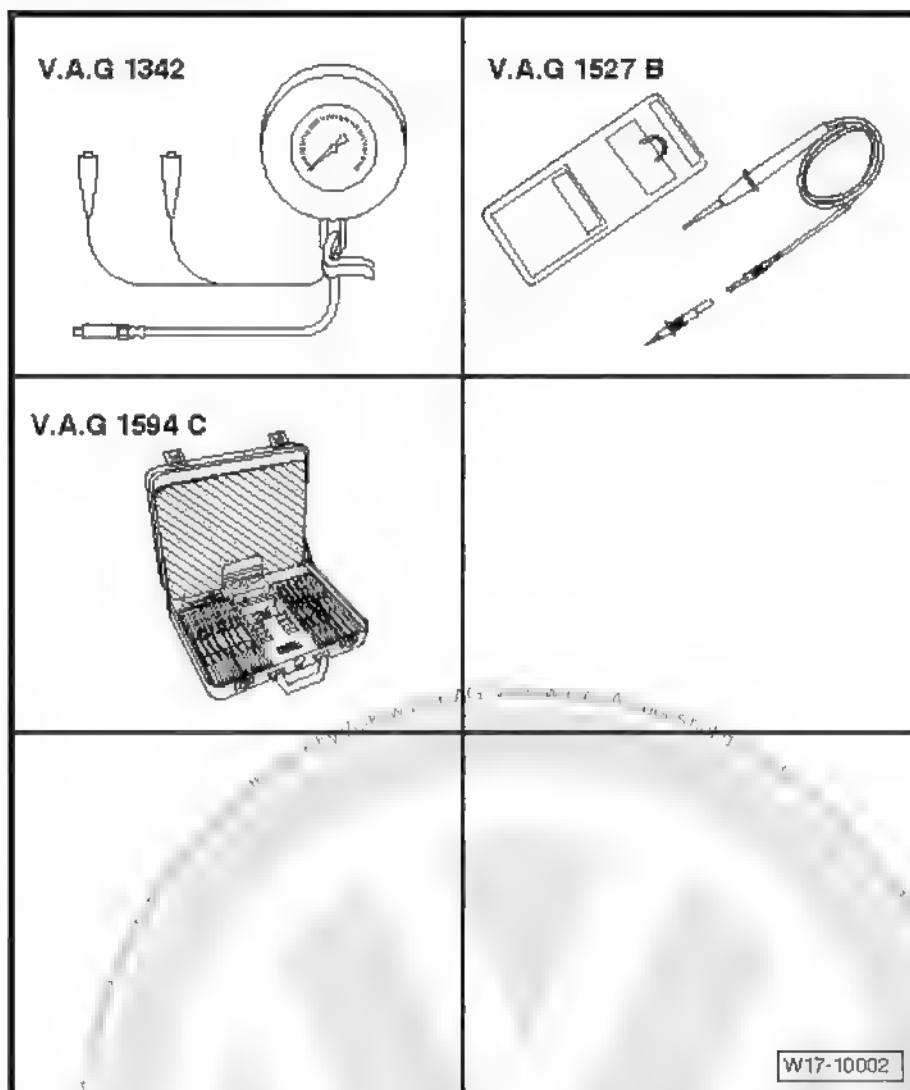


## 1.6 Oil pressure and the Oil pressure switch - F1- - check





Special tools and workshop  
equipment required



- ◆ Oil pressure gauge - VAG 1342-
- ◆ Tension control - VAG 1527 B-
- ◆ Auxiliary measuring cable set - VAG 1594 C-

### 1.6.1 Check conditions

- Oil level OK, check ⇒ [page 55](#)
- Engine oil temperature, at least 176 °F (the Radiator fan - V7- must have been activated at least once).



Note

*Operation check and repair of the visual and acoustic indicators of the oil pressure: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*



## 1.6.2 Oil pressure and the Oil pressure switch - F1- - check



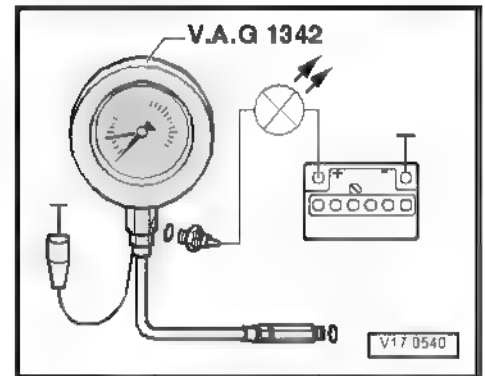
### Note

*Operation check and repair of the visual and acoustic indicators of the oil pressure. → Current flow diagrams, Electrical fault finding and Fitting locations*

### Test sequence

- Remove Oil pressure switch - F1- and install onto Oil pressure gauge - VAG 1342- .
- Install the Oil pressure meter - VAG 1342- in place of the Oil pressure switch - F1- on the engine cylinder head.
- Place the brown cable of the test device in the earth (-).
- Connect the Voltage tester - V.A.G 1527 B- with the Auxiliary cable - V.A.G 1594 A- to the positive Battery - A- terminal (+) and the Oil pressure switch - F1- . The LED shall not light up.
- If the LED does light up, replace the Oil pressure switch - F1- .
- Run engine and slowly increase the speed (rpm). With a positive pressure of 0.3...0.7 bar, the LED must light, otherwise, replace the Oil pressure switch - F1- .
- Increase engine speed. At 2000 rpm and an oil temperature of 80°C, the positive oil pressure should be at least 2.0 bar.

At a higher speed, the positive oil pressure must not exceed 7.0 bar.





## 19 – Cooling

### 1 Cooling system components



#### WARNING

*Whilst working within the engine compartment in particular, due to the limited space available, take the following into account:*

- ◆ *All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.*
- ◆ *Allow easy access to all the moving or hot parts.*



#### Note

- ◆ *The cooling system is under pressure when the engine is hot. Thus, it is necessary to reduce the pressure before conducting repairs.*
- ◆ *Hose connections are fastened by spring clamps. For repairs, use spring clamps only.*
- ◆ *To install spring clamps, we recommend using the Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or the Clamp pliers - VAG 1921-.*
- ◆ *The cooling system hoses should be installed without tension and without coming into contact with other components (observe the marks on the hose).*

Check the cooling system leaks with the Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- and the VAG 1274 adaptor - VAG 1274/8- and the VAG 1274 adaptor - VAG 1274/9-.

Cooling system components, body side ⇒ [page 62](#).

Cooling system components, engine side ⇒ [page 64](#).

Cooling system - drain and fill ⇒ [page 66](#).

Radiator - remove and install ⇒ [page 68](#).

Water pump - remove and install ⇒ [page 70](#).

Coolant preparation proportion ⇒ [page 66](#)

#### 1.1 Cooling system components, body side





### 1 - Radiator

- ☐ Remove and install  
→ [page 68](#) .
- ☐ After replacement,  
change all coolant.

### 2 - Seal

- ☐ Renew after each re-  
moval.

### 3 - Upper hose of the cooling system

- ☐ Fastened to the radiator  
with retention clamps.
- ☐ Check as for the correct  
seating.
- ☐ Cooling system hoses  
connection diagram  
⇒ [page 65](#) .

### 4 - Air deflector

### 5 - 10 Nm

### 6 - Right radiator fan - V35-

- ☐ For vehicles with air  
conditioning only.

### 7 - Retaining clip

- ☐ Check as for the correct  
seating.

### 8 - Mounting bracket

- ☐ Of the Radiator fan -  
V7- .

### 9 - Connectors

- ☐ From cooling system's  
fans.

### 10 - Radiator fan - V7-

### 11 - For cooling system thermostat valve body

- ☐ Cooling system hoses connection diagram ⇒ [page 65](#) .

### 12 - Coolant reservoir

- ☐ Check for cooling system leaks using the Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- with the Adapter for VAG 1274 - VAG 1274/8- .

### 13 - Cap

- ☐ Check, using an Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- and the Adapter for the VAG 1274 - VAG 1274/9- .
- ☐ Test pressure 1.4...1.6 bar.

### 14 - Mounting bracket

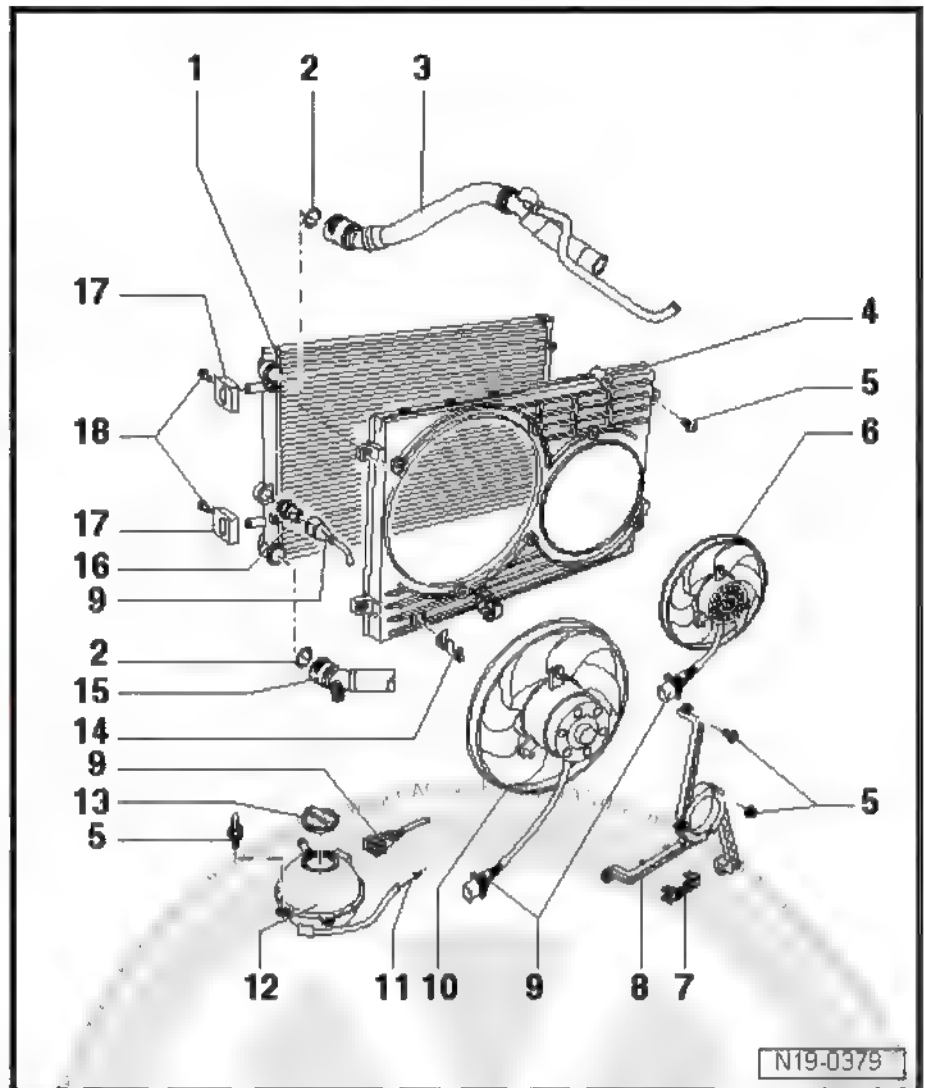
- ☐ From the connection connector for the Radiator fan - V7- .

### 15 - Lower hose of the cooling system

- ☐ Fastened to the radiator with retention clamps.
- ☐ Check as for the correct seating.
- ☐ Cooling system hoses connection diagram → [page 65](#) .

### 16 - Thermal switch - F18-

- ☐ 35 Nm
- ☐ Of the Radiator fan - V7- .





#### Switching temperatures:

- ☐ Speed 1: turns on 95° C; turns off 84° C
- ☐ Speed 2: turns on 102° C; turns off 91° C

#### 17 - Mounting bracket

- ☐ From radiator.
- ☐ Check installation position.
- ☐ Note the different versions

18 - 10 Nm

## 1.2 Cooling system components, engine side

### Thermostat valve body side

1 - 10 Nm

#### 2 - Seal

- ☐ Renew after each removal.

#### 3 - Clip

- ☐ Check as for the correct seating.

#### 4 - To the top of the radiator

- ☐ Cooling system hose connection diagram.

#### 5 - From the lower part of the radiator

- ☐ Cooling system hose connection diagram.

#### 6 - Thermostat valve housing

- ☐ Thermostat valve - Initial opening temperature 87...102° C - final 130° C.
- ☐ Thermostat valve - Opening beginning 8 mm - final 12 mm.

#### 7 - Clip

- ☐ Check as for the correct seating.

#### 8 - To the heat exchanger

- ☐ Cooling system hose connection diagram.

#### 9 - From the heat exchanger

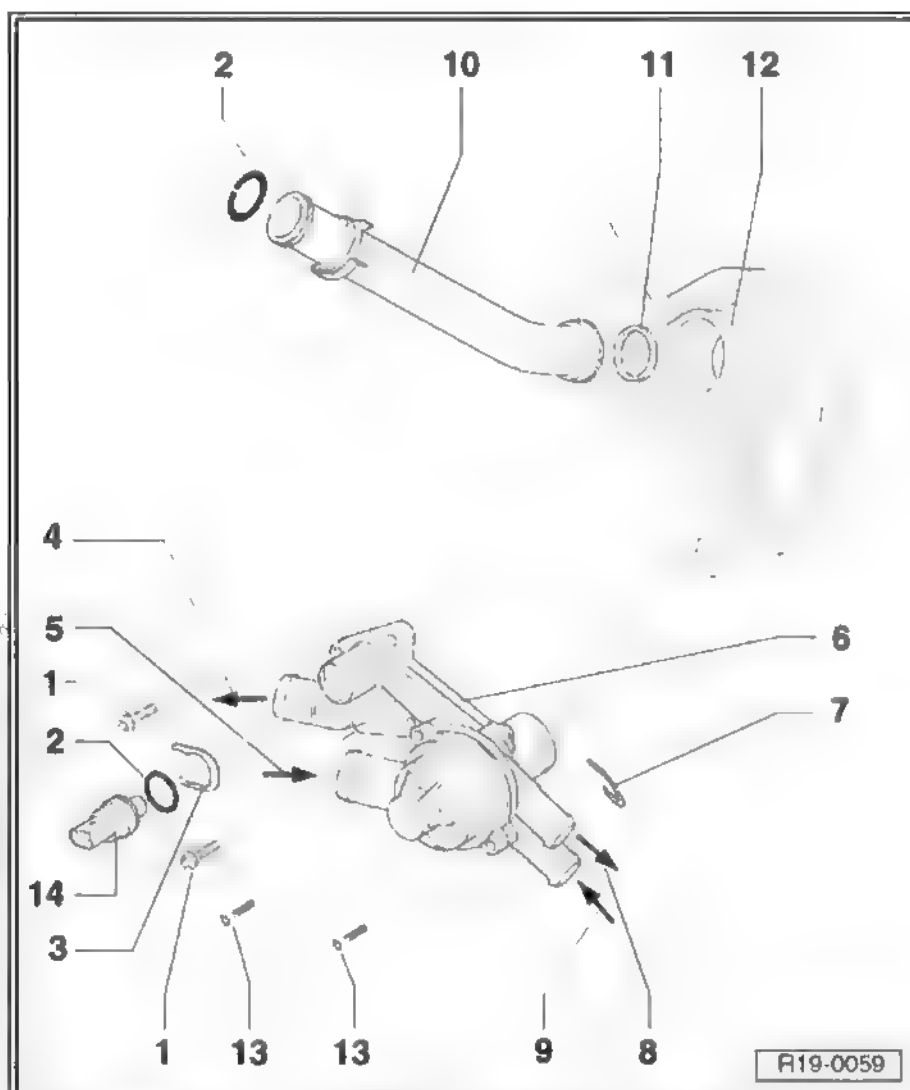
- ☐ Cooling system hose connection diagram.

#### 10 - Cooling system tube

- ☐ Cooling system hose connection diagram.

#### 11 - Seal

- ☐ Renew after each removal.





12 - Engine block water pump housing

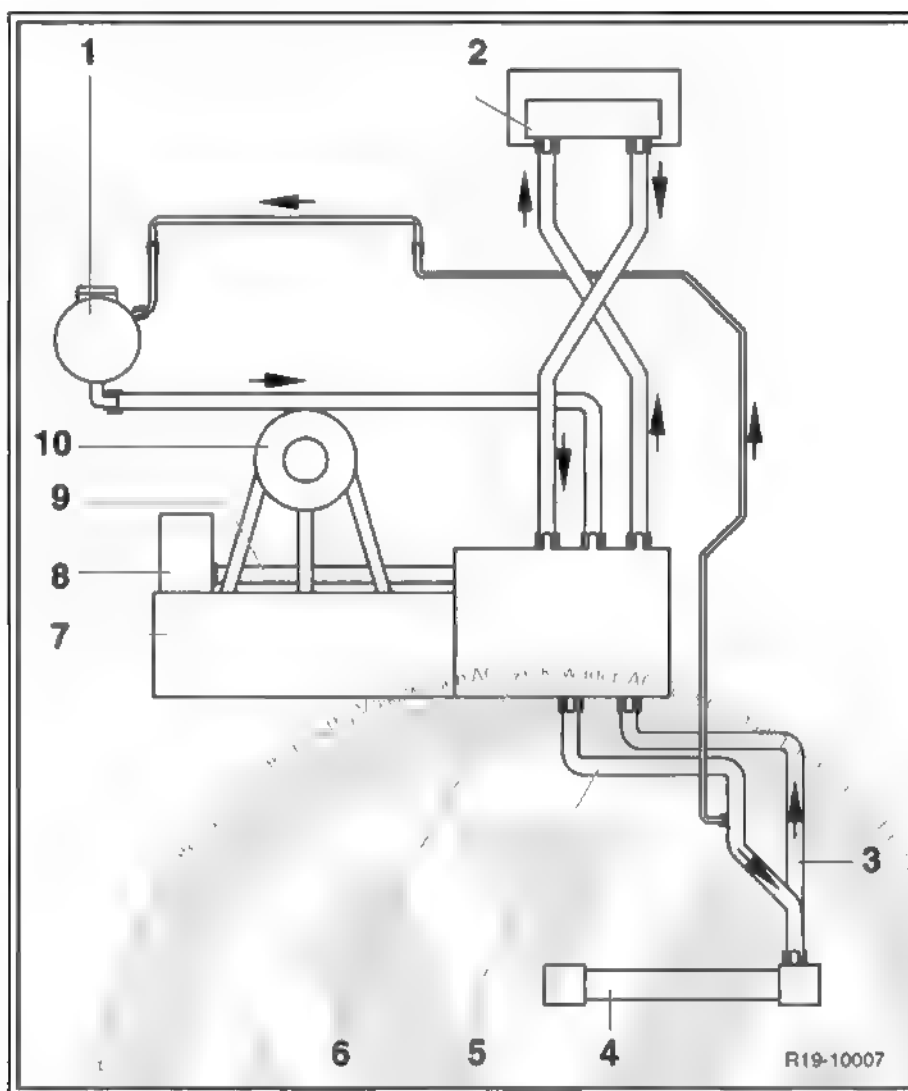
13 - 10 Nm

14 - Coolant temperature sensor - G62-

- ☐ Before removing, eliminate cooling system pressure, if necessary.

### 1.3 Hose connection diagram for cooling system

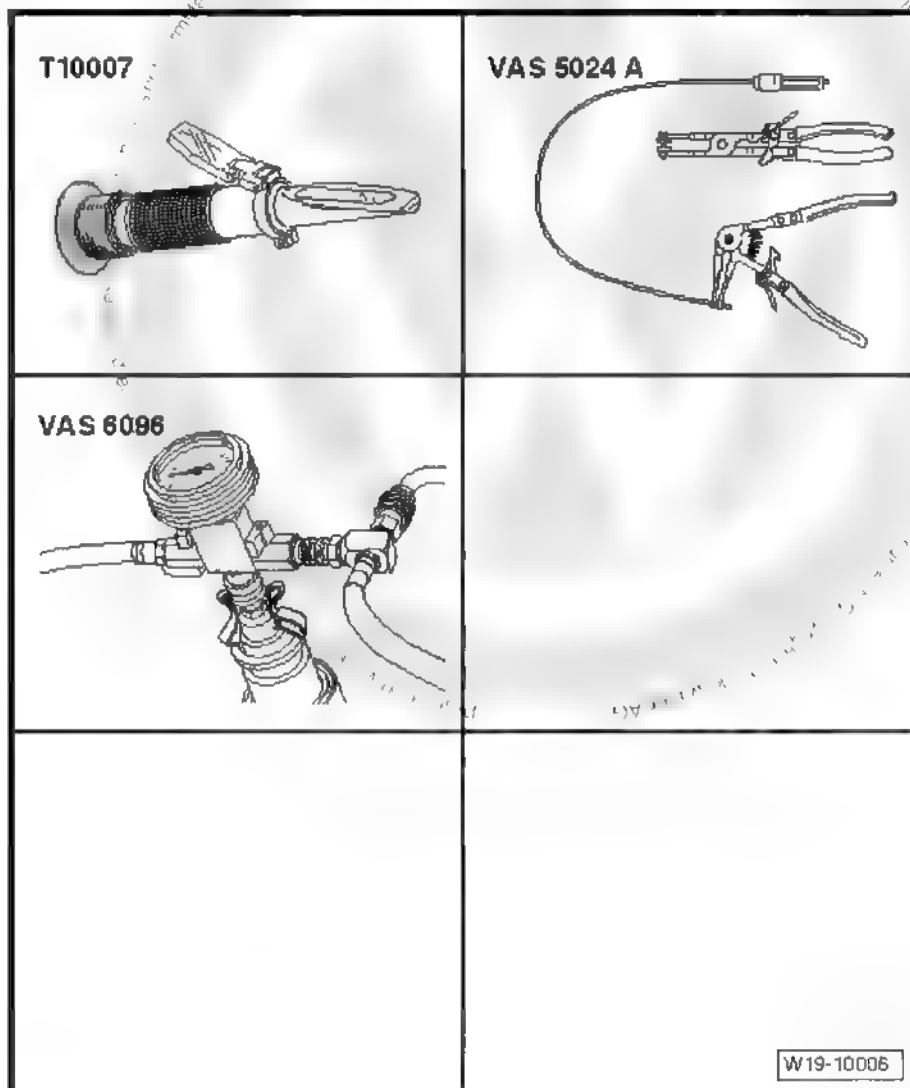
- 1 - Coolant reservoir
- 2 - Heat exchanger
- 3 - Lower hose of the cooling system
- 4 - Radiator
- 5 - Upper hose of the cooling system
- 6 - Thermostat valve housing
- 7 - Cylinder head/cylinder block
- 8 - Water pump
- 9 - Cooling system tube
- 10 - Intake manifold





## 1.4 Cooling system - drainage and replenishment

Special tools and workshop  
equipment required



- ◆ Refractometer - T10007A-
- ◆ Standard Pliers for spring-type clip or VAS 5024A - VW 5162-
- ◆ Cooling system supply unit - VAS 6096-
- ◆ Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B-
- ◆ Adapter for VAG 1274 - VAG 1274/8-
- ◆ Oil trap - VAG 1306-

### 1.4.1 Drain



#### WARNING

*When opened, hot vapours may come from the coolant tank. Wear goggles and protection clothing as prevention against injuries to the eyes and burns. Place a cloth on the cap and open it carefully.*



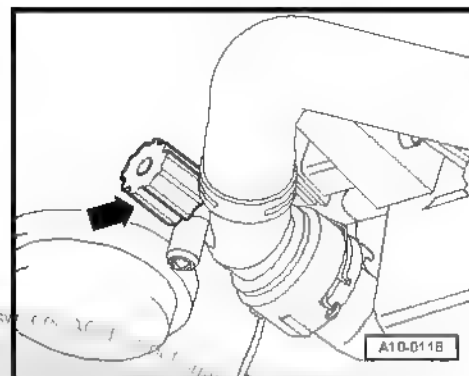
- Remove lower noise insulation from engine compartment.
- Remove coolant expansion tank lid.
- Open the drainage device on the radiator cooling system  
-arrow-

**Note**

*Comply with the waste disposal standards!*

**Verification****Note**

- ◆ According to the TL 774 J standard, only the use of G13 anti-freeze additive Coolant additive - G 013 A8J M1- is allowed. It is identified by the red colour.
- ◆ Under no circumstances ever mix G13 Coolant additive - G 013 A8J M1- with other antifreeze additives.
- ◆ If the fluid in the reservoir is brown, it indicates that the G13 Coolant additive - G 013 A8J M1- got mixed with another antifreeze. In that case, renew the coolant entirely.
- ◆ The G13 Coolant additive - G 013 A8J M1- and antifreeze additives labelled "compliant with TL 774 J", prevent damages resulting from corrosion, freezing or formation of mould which further increase the boiling temperature of the coolant. Therefore, the cooling system must always have the recommended mixture of antifreeze and anti-corrosion products.
- ◆ Due to the high boiling temperatures it provides, antifreeze is especially helpful in tropical countries, ensuring safe operation when the engine is submitted to heavy-duty work.
- ◆ Antifreeze protection must be assured to approximately -25 °C (in countries with Arctic climates, to approximately -35 °C).
- ◆ Coolant concentration must not be diluted by adding water during hot seasons, or in countries with hot climates. The percentage of antifreeze should be at least 40 %.
- ◆ If the climate requires higher antifreeze protection, the percentage of G13 Coolant additive - G 013 A8J M1- may be increased, but only up to the limit of 60 % (antifreeze protection down to -40 °C). The higher proportion lowers cooling capacity and antifreeze protection.
- ◆ In order to determine the antifreeze protection density, use the Refractometer - T10007A-.
- ◆ Do not reuse old coolant when replacing the radiator, heat exchanger, cylinder head or cylinder head gasket.
- ◆ Use only clean drinkable water to prepare the coolant.

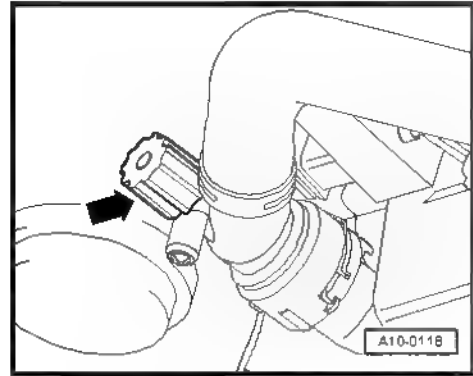
**Recommended mixture proportion:**

Antifreeze Protection up to	Antifreeze percentage	G 13 (l) <sup>7)</sup>	G 13 (gal) <sup>7)</sup>	Water (l) <sup>7)</sup>	Water (gal) <sup>7)</sup>
-25 °C	40 %	2.25 l	0.59 gal	3.35 l	0.88 gal
-35 °C	50 %	2.8 l	0.74 gal	2.8 l	0.74 gal

<sup>7)</sup> Coolant quantity may vary depending on the equipment on the vehicle



- Close the drainage device -arrow- for the cooling system
- Install engine compartment lower noise insulation



### 1.4.2 Refill

With the Cooling system supply unit - VAS 6096-

- Fill cooling system circuit with the Cooling system supply unit - VAS 6096- : ⇒ Operational instructions for the cooling system supply unit next to VAS 6096

Without the Cooling system supply unit - VAS 6096-

- Fill with coolant up to the max. mark on the coolant tank.

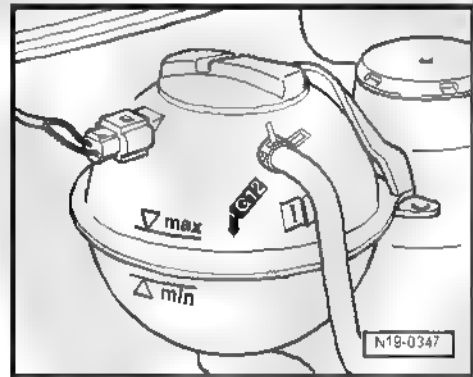
With or without Cooling system supply unit - VAS 6096-

- Close the coolant tank.
- Turn off heating command.
- Start the engine and keep the engine speed for nearly 3 minutes at approx. 2000 rpm.
- Let the engine run until the Radiator fan - V7e starts working.



#### WARNING

*When opened, hot vapours may come from the coolant tank. Wear protection goggles and clothing to prevent eye injuries and burns. Place a cloth on the cap and open it carefully.*

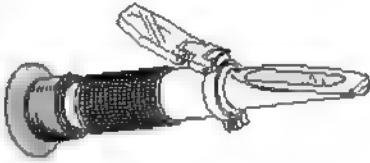
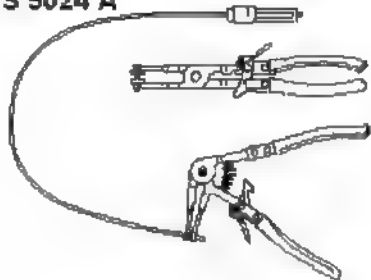



- Check coolant level, adding more coolant, if necessary. With a hot engine, the coolant level in the tank must in the maximum marking, and it should be in the between the maximum and minimum markings with the engine cold.

### 1.5 Radiator - remove and install



Special tools and workshop  
equipment required

<p><b>T10007</b></p> 	<p><b>VAS 5024 A</b></p> 
<p><b>V.A.G 1331</b></p> 	
	<p>W19-10007</p>

- ◆ Refractometer - T10007A-
- ◆ VAS 5024A or Standard-type clamp pliers - VW 5162-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

#### Removal

- Put front panel in work position: ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front part .
- Drain cooling system ⇒ [page 66](#) .
- Loosen cooling system hoses from radiator.
- Remove the connector from the Radiator fan thermal switch - F18- and from the Radiator fan - V7- .
- Remove the radiator fastening screws and remove the radiator with Radiator fan - V7- from below.

#### Vehicles with air conditioning

Observe additional indications and installation works



#### Note

*To prevent damages in the condenser, as well as in the refrigerant gas pipes it is necessary to make sure the hoses are not tractioned, bent or deformed.*

- Loosen the brace(s) from cooling gas pipe(s).
- Loosen the radiator condenser and fasten it to the front panel.

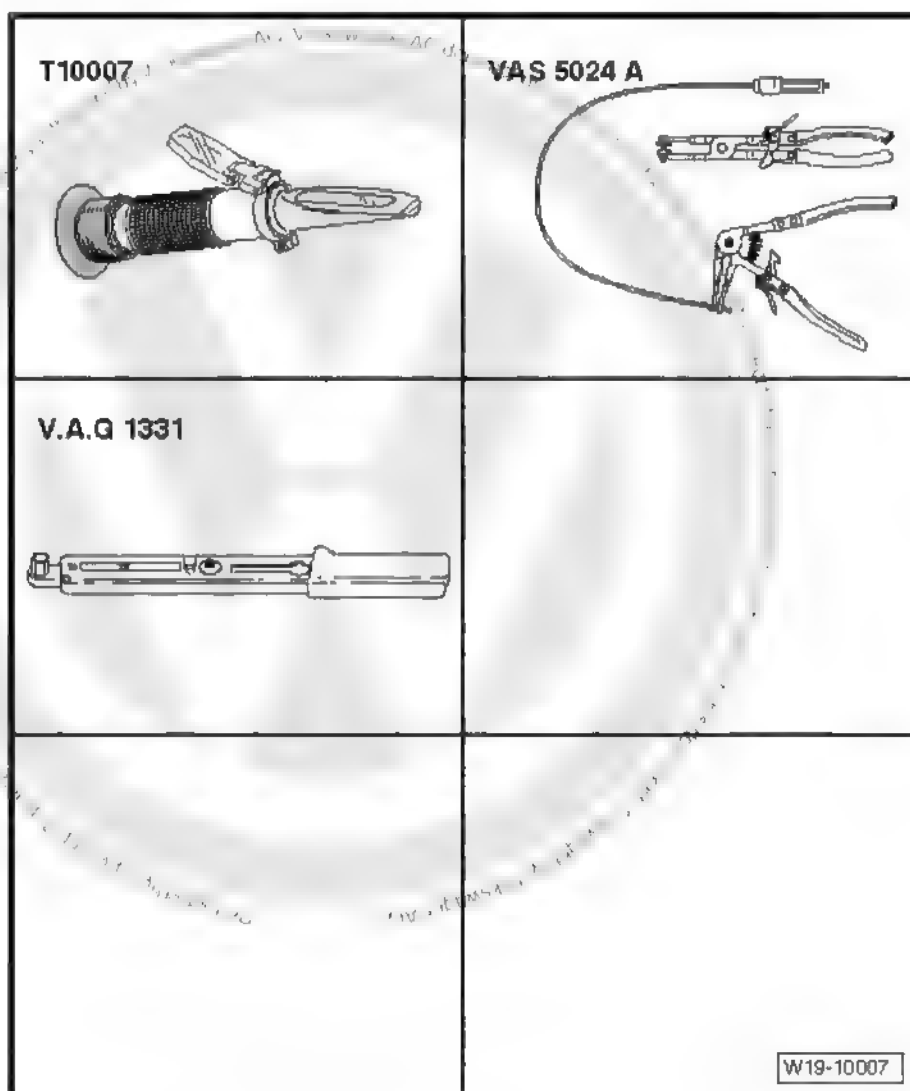
#### Installation

The installation is done in the reverse order, paying attention to the following:

Replenish cooling system ⇒ [page 66](#).

- Electric and installation connections: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

## 1.6 Water pump - remove and install



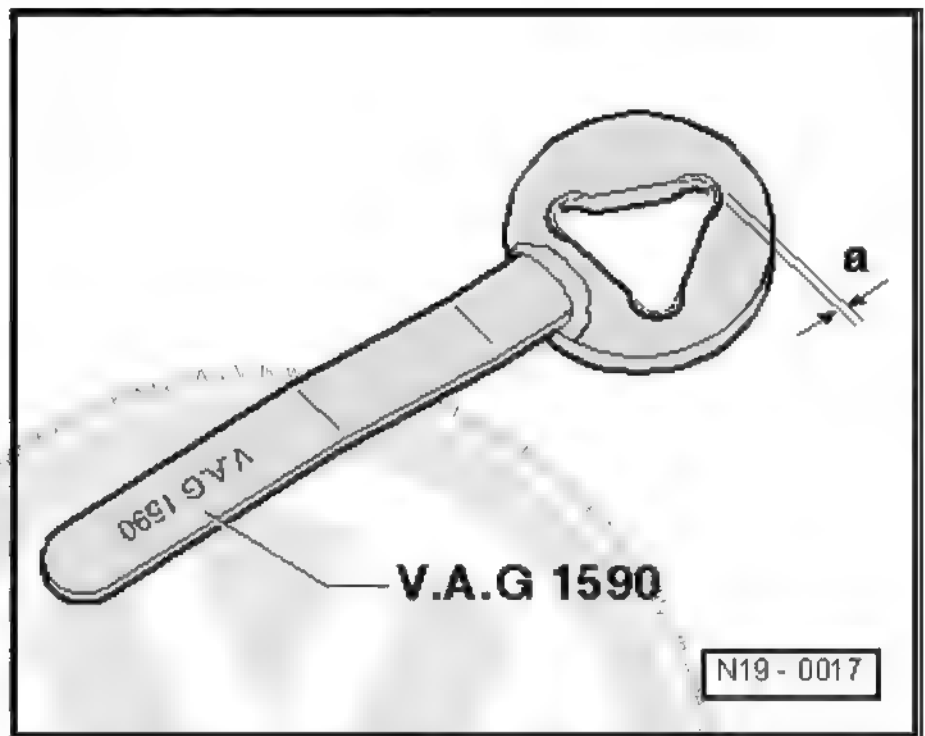
#### Special tools and workshop equipment required

- ◆ Refractometer - T10007A-





- ◆ VAS 5024A or Standard-type clamp pliers - VW 5162-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



- ◆ Water pump wrench - VAG 1590-
- Due to the change of the fastening screws of the water pump pulley, file the three circular shoulders at least: -a = 1 mm-.

**i** Note

- ◆ *The integrated joint in the water pump must not be separated from the pump.*
- ◆ *In case of damages and leaks, replace the entire water pump together with the joint.*

#### Removal

- Drain the cooling system ⇒ [page 66](#).
- Remove the Poly-V belt ⇒ [page 14](#).
- Remove pulley from water pump.
- Remove water pump fastening screws.
- Remove the water pump

#### Installation

The installation is done in the reverse order, paying attention to the following:

- Install the water pump on the engine block.
- Tighten the fastening bolts to 25 Nm.
- Tighten the fastening screws of the water pump pulley to 20 Nm.



- Install Poly-V belt ➔ [page 14](#) .
- Replenish cooling system ➔ [page 66](#) .





## 20 – Fuel supply system

### 1 Fuel supply system components - removal and installation



#### Note

- ◆ Always replace tightening clamps with spring clamps.
- ◆ The fuel pipes in the engine can only be fastened with spring clamps. The use of tightening or screw clamps is not permitted.
- ◆ To install spring clamps, we recommend using the VAS 5024A or Standard-type clamp pliers VW 5162-.

Fuel supply system components - removal and installation  
⇒ [page 73](#) .

Safety measures for working on fuel supply system  
⇒ [page 76](#) .

Follow the cleaning norms ⇒ [page 76](#) .

Fuel pump (pre-supply pump) - G6 - - remove and install  
⇒ [page 77](#) .

Fuel gauge sender - G- - remove and install ⇒ [page 79](#) .

Fuel tank - remove and install ⇒ [page 79](#) .

Fuel interruption in case of accident ⇒ [page 81](#) .

Fuel pump (pre-supply pump) - G6- - check ⇒ [page 81](#) .

Feeding system - drain the air ⇒ [page 90](#) .

#### 1.1 Fuel supply system components - removal and installation



- 1 - Fastening clip
- 2 - Reservoir filler cap
- 3 - Seal
  - ☐ Replace if damaged
- 4 - Fastening bolt
- 5 - Compartment lid of the fuel tank filler neck
  - ☐ With rubber boot.
  - ☐ Remove and install ⇒ General body repairs, exterior; Rep. gr. 55 ; Caps .

- 6 - Vent valve
- 7 - Gravity valve
  - ☐ Remove rear right wheel case protector.
  - ☐ Remove the lid for fuel tank nozzle compartment with bellows.
  - ☐ Check valve passage continuity. Perpendicular valve: open. Valve inclined 45°: closed.

- 8 - Fuel supply line

- 9 - Spring clip

- 10 - Fuel reservoir
  - ☐ Remove using the Gearbox or engine + gearbox assembly jack or VAG 1383A - EQ 7081- .

- ☐ Remove and install ⇒ [page 79](#) .

- 11 - 23...29 Nm

- 12 - Lines
  - ☐ Anti-choke from fuel tank to the expansion tank.

- 13 - Lines
  - ☐ Vent from fuel tank to the expansion tank.

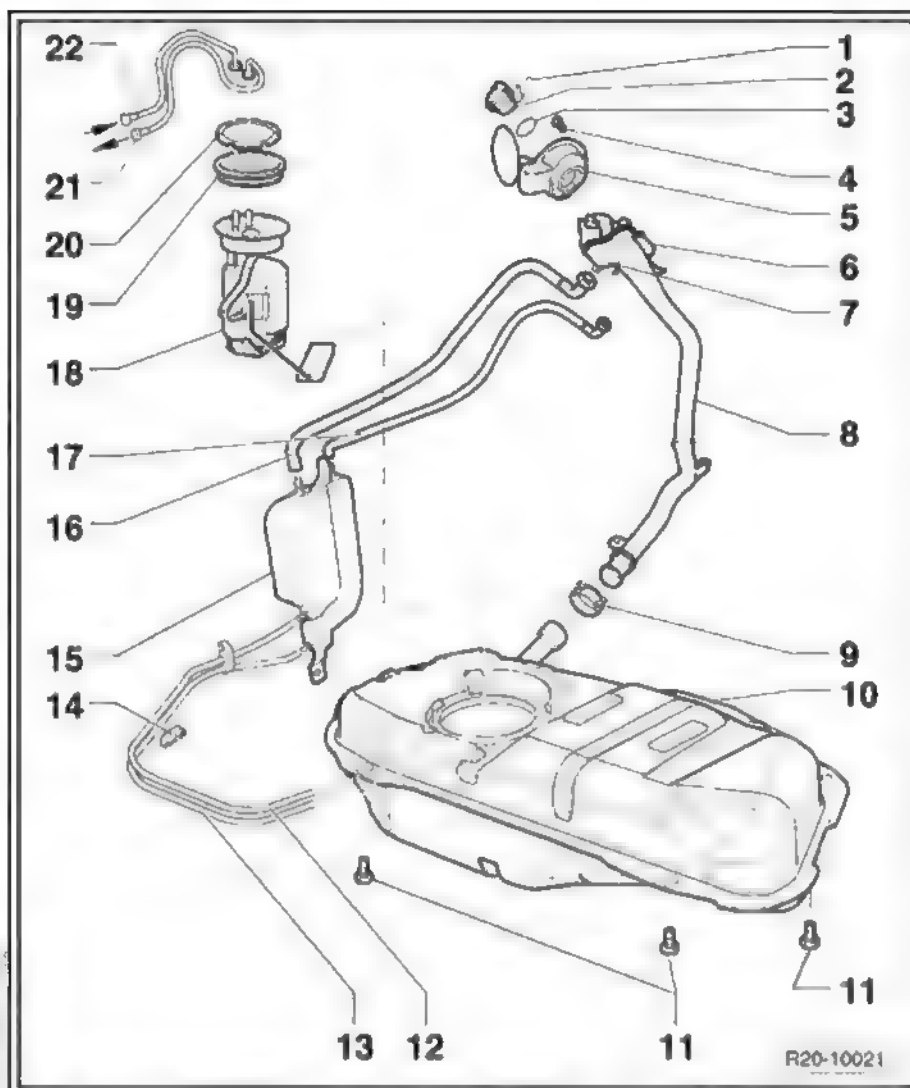
- 14 - Bearing

- 15 - Expansion tank

- 16 - Lines
  - ☐ Anti-chock for the housing of the supply nozzle of the fuel tank.

- 17 - Lines
  - ☐ Vent for the housing of the supply nozzle of the fuel tank.

- 18 - Fuel pump (pre-supply pump) - G6-
  - ☐ Remove and install ⇒ [page 77](#) .
  - ☐ Clean filter, if dirty.
  - ☐ Fuel pump (pre-supply pump) - G6- - check ⇒ [page 81](#) .
  - ☐ Attention to the installation position in the fuel tank ⇒ [page 75](#)





### 19 - Seal joint of the Fuel pump (pre-supply pump) - G6-

- ☐ Remove and install [see page 77](#).

### 20 - Circlip (sliding)

### 21 - Supply tubes

- ☐ Black.
- ☐ Make sure it is well fastened.
- ☐ For fuel distributor.

### 22 - Return tubing

- ☐ Blue.
- ☐ Fastened laterally to the fuel reservoir.
- ☐ Make sure it is well fastened.

### Expansion tank

1 - For the housing of the supply nozzle of the fuel tank

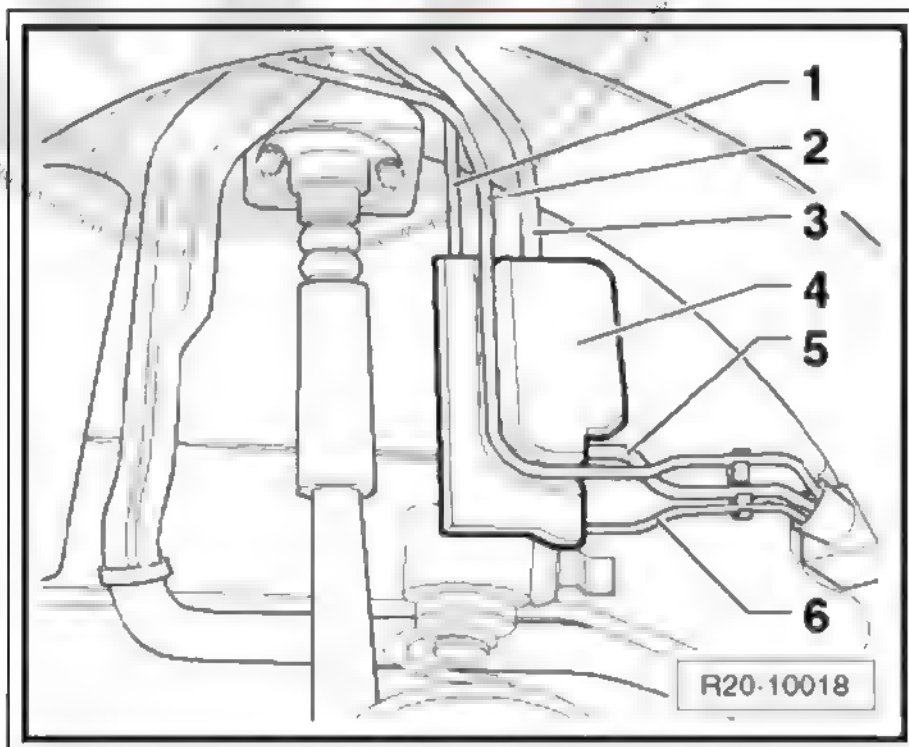
2 - For activated charcoal filter

3 - For the housing of the supply nozzle of the fuel tank

4 - Expansion tank

5 - For expansion tank

6 - For expansion tank



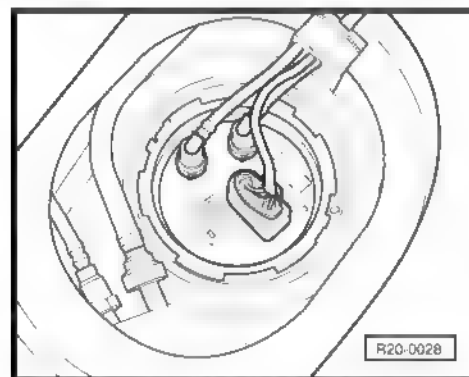
### Installation position for the Fuel pump (pre-supply pump) - G6-

The -arrow- in the Fuel pump (pre-supply pump) - G6- must match the one in the tank.



#### Note

*After installation of the Fuel pump (pre-supply pump) - G6-, check whether the supply, return and vent pipes are still fastened to the fuel tank.*





### Check the vent valve

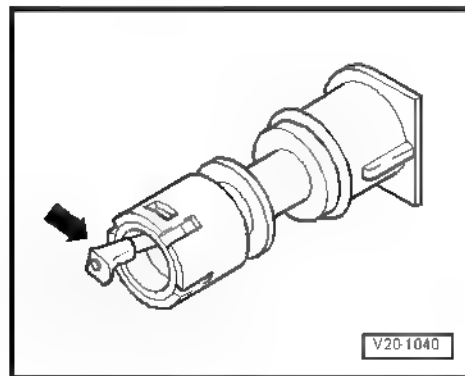
Lever in the resting position: closed

Lever pushed in the arrow direction: open



#### Note

Before installing the vent valve, remove the fuel tank cap



## 1.2 Safety measures regarding work on the fuel supply



### WARNING

*The fuel supply tube is under pressure! Wear protection goggles and gloves to avoid injuries and prevent contact with the skin. Before loosening the tube connections, wrap the connection points with cloth. Then eliminate the pressure, carefully pulling the tube.*



### Caution

*In all assembly works, specially in the engine compartment, due to the lack of space, bear in mind the following:*

- ◆ *Install all types of pipes (for instance, fuel, hydraulic, charcoal filter system, cooling system, cooling gas, brake fluid, vacuum pipes) and the electric cables so as to redo the original interconnection.*
- ◆ *Make sure there is sufficient room regarding all movable or warm components to prevent damages in the connections.*

In the removal and installation of the Fuel pump (pre-supply pump) - G6- with the fuel tank full or partially full, bear in mind the following:

- ◆ Before starting installation work, place the suction hose of a gas extraction device near the fuel tank opening in order to extract to absorb gases released by the fuel. If an extracting device is unavailable, use a radial fan (the engine must be out of air flow) with rate of air displacement greater than 15 m<sup>3</sup>/hour
- ◆ Avoid skin contact with fuel! Wear fuel resistant gloves!
- ◆ Due to safety reasons, before opening the fuel system, remove fuse number 33 from the fuse box, as the Fuel pump (pre-supply pump) - G6- can be activated

## 1.3 Cleaning rules

To perform works in the fuel supply/injection, the following "5 cleaning rules" must be carefully respected:

- ◆ Carefully clean the union points and surrounding surfaces before releasing them.
- ◆ Place parts on clean base and cover them. Use lint-free cloths!



- ◆ Cover or carefully close open parts should repair not be carried out immediately
- ◆ Install only parts that are clean: Remove parts from the packaging immediately before their installation. Do not use parts that have been stored outside the package (for example, in tool boxes)
- ◆ With system open: Do not work with compressed air. Do not move the vehicle.

## 1.4 Fuel pump (pre-supply pump) - G6- - remove and install

Special tools and workshop equipment required

- ◆ Wrench - VW 5321/9- or Wrench - T10334-

VW 5321/9



Q00-0016

V.A.G 1332



W00-0426

- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-

### 1.4.1 Removal

- Take safety precautions before starting with the removal  
⇒ [page 76](#) .
- Follow cleaning rules ⇒ [page 76](#) .
- First, check if the vehicle has code radio; if positive, check the anti-theft code.
- With the ignition off, disconnect the earth wire from the Battery - A- .
- Fold rear seat forward
- Remove the Fuel pump (pre-supply pump) - G6- access cover.



#### WARNING

*Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.*



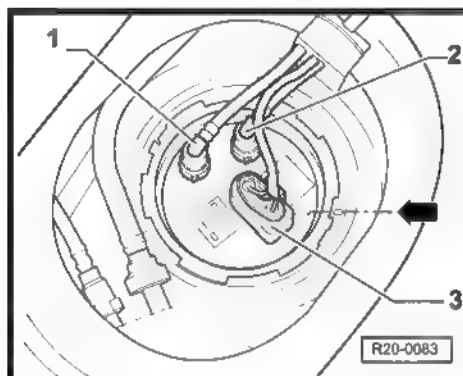
- Remove the return -1- and supply -2- lines and the connector -3- from the Fuel pump (pre-supply pump) - G6- .

The -arrow- shows the installation position of the Fuel pump (pre-supply pump) - G6- .



#### Note

To remove fuel hoses, press the safety key located under the connection.

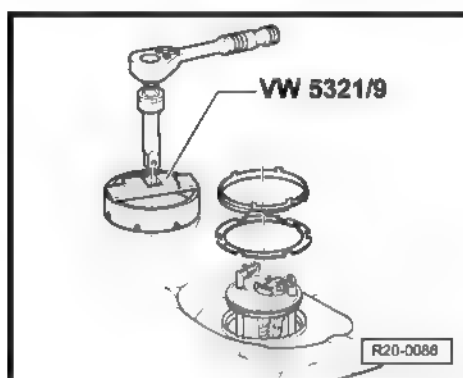


- Remove the lock with a Wrench - VW 5321/9- or Wrench - T10334- .
- Remove the Fuel pump (pre-supply pump) - G6- and the seal from the fuel tank opening.



#### Note

In case of replacing Fuel pump (pre-supply pump) - G6- , empty the old Fuel pump (pre-supply pump) - G6- before disposing it.



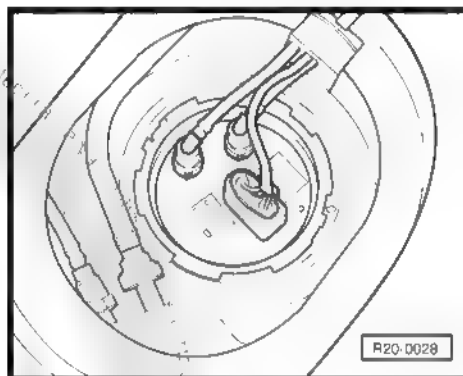
## 1.4.2 Installation

- The Fuel pump (pre-supply pump) - G6- should be installed in reverse order of removal.



#### Note

- ◆ Try not to bend the Fuel gauge sensor - G- during installation.
- ◆ Install the Fuel pump (pre-supply pump) - G6- sealing dry on fuel tank opening.
- ◆ Lubricate seal using fuel merely for the purpose of installing the Fuel pump (pre-supply pump) - G6- .
- ◆ Observe installation position of the Fuel pump (pre-supply pump) - G6- -arrow-.
- ◆ The mark on the Fuel pump (pre-supply pump) - G6- shall match that on the body.
- ◆ Check that the fuel hoses are firmly connected
- ◆ Do not confuse the supply and return hoses.
- ◆ After installation of the Fuel pump (pre-supply pump) - G6- , check whether the supply, return and vent pipes are still fastened to the fuel reservoir.



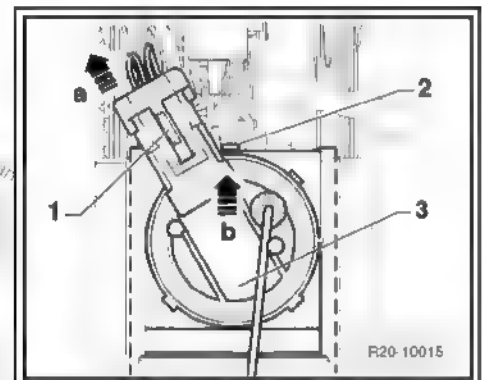




## 1.5 Fuel gauge sensor - G- - remove and install

### 1.5.1 Removal

- Remove Fuel pump (pre-supply pump) - G6- ➔ [page 77](#) .
- Disconnect the connector from the Fuel gauge sensor - G- by displacing the lock -1- and moving it towards -arrow a-.
- Press lock -2- and move the Fuel gauge sensor - G- -3- upwards -arrow b-.



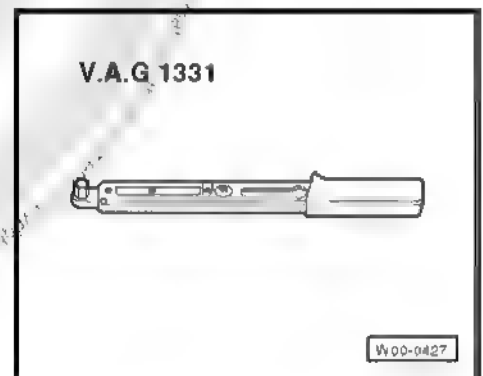
### 1.5.2 Installation

- Position the Fuel gauge sensor - G- in the Fuel pump (pre-supply pump) guides - G6- and press downwards until it fits.
- Install the Fuel gauge sensor connector - G- .

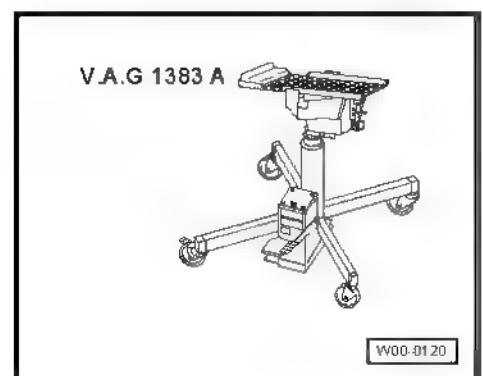
## 1.6 Fuel reservoir - remove and install

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

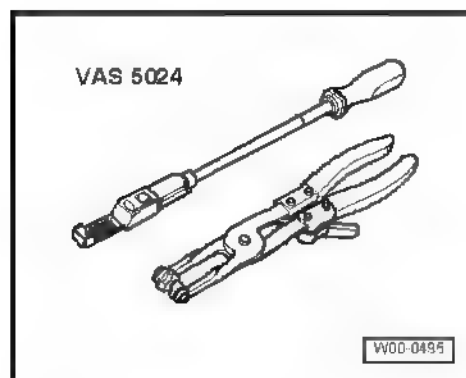


- ◆ Engine and gearbox jack - EQ 7081- or Gearbox or engine + gearbox set jack - VAG 1383A-





- ◆ VAS 5024A or Standard-type clamp pliers - VW 5162-



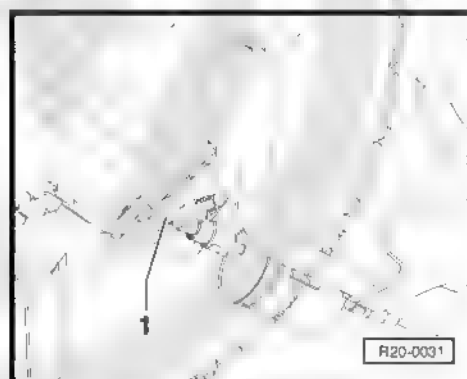
### 1.6.1 Removal

- Observe safety measures before starting removal works  
⇒ [page 76](#) .
- First, check if the vehicle has code radio; if positive, check the anti-theft code.
- Remove fuel reservoir lid.
- With the ignition turned off, disconnect the earth cable from the battery - A- .
- Empty fuel tank with the Fuel absorption equipment - VAS 5190- and clean surrounding area of the filling nozzle.
- Fold rear seat forward.
- Remove the Fuel pump (pre-supply pump) - G6- access cover.
- Disengage the 4-poles connector from Fuel pump (pre-supply pump) - G6- .
- Remove the fuel tank hoses near the Fuel pump (pre-supply pump) - G6- .
- Loosen exhaust system. The exhaust system must be fastened to the body with wire, slightly lowered.
- Remove the heat deflector between the exhaust and the fuel tank.
- Loosen supply hose -1- from the fuel filter.
- Remove the clamp from supply line near the fuel tank with VAS 5024A or Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- .
- Remove fastening bolts, supporting the fuel tank with the Engine / gearbox jack - EQ 7081- or Engine / gearbox jack - VAG 1383A- .
- Lower the fuel tank



#### WARNING

*Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.*



### 1.6.2 Installation

Installation is carried out by reversing the removal sequence, considering the following.



- ◆ Install vent and fuel hoses without bending them.
- ◆ Check that the fuel hoses are firmly connected.
- ◆ Do not invert supply and return hoses (blue or blue-marked return hose, black supply hose).



#### Note

- ◆ *Once the fuel tank is installed, check that the supply, return and ventilation hose assemblies are still attached.*
- ◆ *If the fuel tank has been replaced, it is necessary to drain the air from the fuel system ⇒ [page 79](#).*

## 1.7 Fuel interruption in case of accident

### 1.7.1 Operation

The fuel interruption in case of accident aims to reduce the risk of fire of the vehicle after a collision, in which the Fuel pump (pre-supply pump) - G6- is turned off by the Fuel pump relay - J17- . At the same time, this piece of equipment also increases comfort at the engine start.

When opening the fuel system, follow the safety measures  
⇒ [page 76](#) .

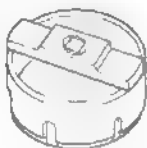




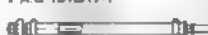




- Check the Fuel pump relay - J17- : ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

## 1.8 Fuel pump (pre-supply pump) - G6- - check





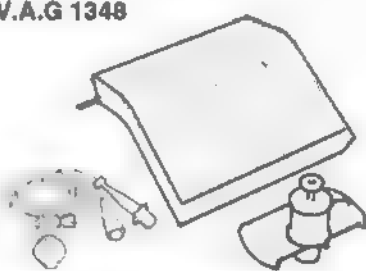
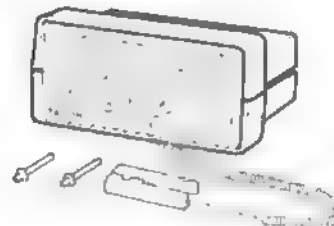
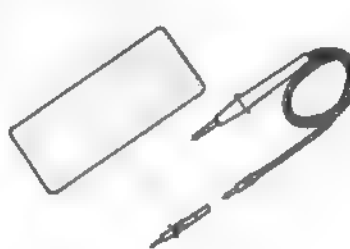
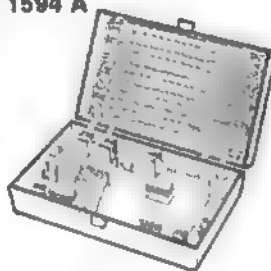
Special tools and workshop equipment required

<b>VW 5321/9</b> 	<b>V.A.G 1318</b>  
<b>V.A.G 1318/1</b> 	<b>V.A.G 1318/11</b> 
<b>V.A.G 1318/17</b>    	<b>V.A.G 1332</b>   <b>Q20-0002</b>

- ◆ Wrench - VW 5321/9- or Wrench - T10334-
- ◆ Pressure gauge - VAG 1318-
- ◆ Adapter - VAG 1318/13-
- ◆ Adapter - VAG 1318/11-
- ◆ Adapter - VAG 1318/17-
- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-



**Special tools and workshop equipment required**

<p><b>V.A.G 1348</b></p> 	<p><b>V.A.G 1715</b></p> 
<p><b>V.A.G 1527 B</b></p> 	<p><b>V.A.G 1594 A</b></p> 
	<p>Q20-10001</p>

- ◆ Adapting cable - VAG 1348/3-2-
- ◆ Test probe - EQ 7300- or Test probe - VAG 1527B-
- ◆ Auxiliary measuring set - VAG 1594A-
- ◆ Multimeter - VAG 1715-
- ◆ -Graduated container-
- ◆ ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



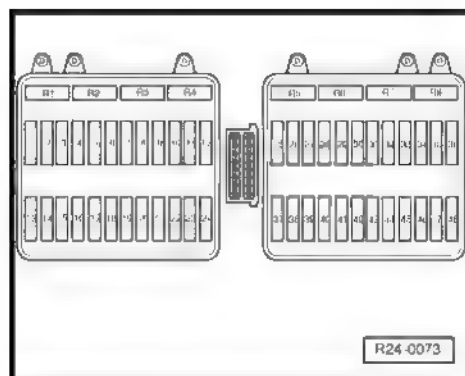
### 1.8.1 Check conditions

- Fuse number 33 OK.
- The Battery - voltage must be at least 11.5 V.
- All electrical components, such as lights and rear window de-mister, must be off.
- If the vehicle is equipped with air conditioning, the same should be switched off.



#### Note

Pay attention to the operation description of the fuel interruption in case of accident ➔ [page 81](#).



### 1.8.2 Operation of the electrical supply - check



#### Note

In the following operations sequence, it may be necessary to disconnect the earth cable from the Battery - A-. Therefore, check if a code radio is installed. Should that be the case, first obtain the anti-theft code.

- Tilt rear seat forwards.
- Remove the cover beneath the seat.
- Turn the ignition on. The Fuel pump (pre-supply pump) - G6- must operate in an audible way for approx. 1 second.

If the Fuel pump (pre-supply pump) - G6- does not work:

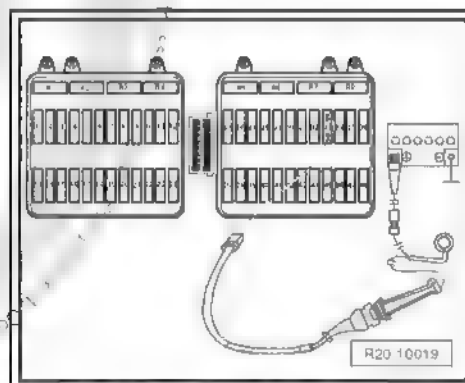
- Turn the ignition off.
- Remove fuse holder cover.
- Remove fuse 33 from the ( Fuel pump (pre-supply pump) - G6- fuse holder.
- Connect the Remote control - VAG 1348/3A- and the Adapter cable - VAG 1348/3-2- to the bottom contact of the Fuel system pressurisation pump - G6- fuse 33 and to the positive (+) terminal of the Battery - A-.
- Activate the Remote control - VAG 1348/3A-.

If the Fuel pump (pre-supply pump) - G6- works:

- Check the operation of the Fuel pump relay - J17- , according to ➔ Current flow diagrams, Electrical fault finding and Fitting locations.

If the Fuel pump (pre-supply pump) - G6- does not work:

- Disengage the 4-poles connector from Fuel pump (pre-supply pump) - G6-.





- Couple the Test probe - EQ 7300- or Test probe - VAG 1527B- with Auxiliary cables - VAG 1594A- with Auxiliary cables to the external contacts of the connector.
- Activate the Remote control - VAG 1348/3A- .

The LED should light up.

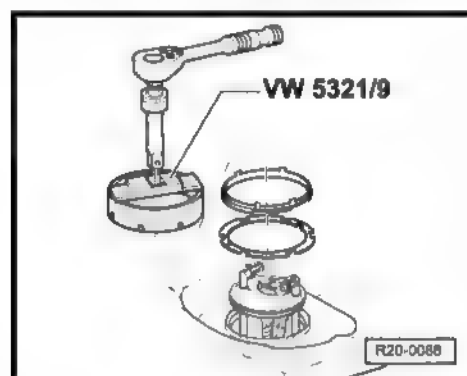
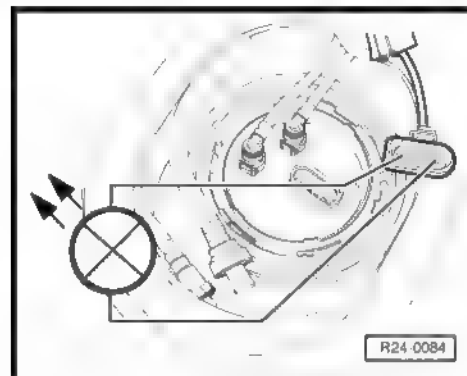
- If the LED does not light up:
- Locate and eliminate cable interruption, according to⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

The LED lights up (correct power supply):

- Remove the Fuel pump (pre-supply pump) - G6- with a Wrench - VW 5321/9- or Wrench - T10334- .
- Check if cables are coupled to the Fuel pump - G23- .

In case there is no cable interruption:

- Fuel pump (pre-supply pump) - G6- damaged, replace.



### 1.8.3 Fuel flow - check

### 1.8.4 Test conditions

- The supply of the Fuel pump (pre-supply pump) - G6- is OK.
- Remote control - VAG 1348/3A- installed.
- Fuel pressure regulator and Fuel pump (pre-supply pump) - G6- pressure in order ⇒ [page 111](#) .

### 1.8.5 Test sequence



#### Note

The fuel flow rate is determined at 3.0 bar on vehicles manufactured up until May/2006 and at 4.0 bar on vehicles manufactured as of June/2006. For this reason fuel pressure must be checked before measuring the flow.

- Remove fuel reservoir lid.

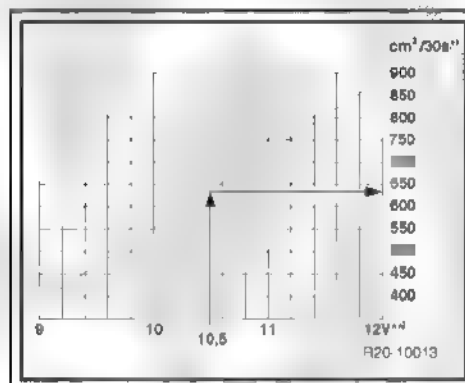
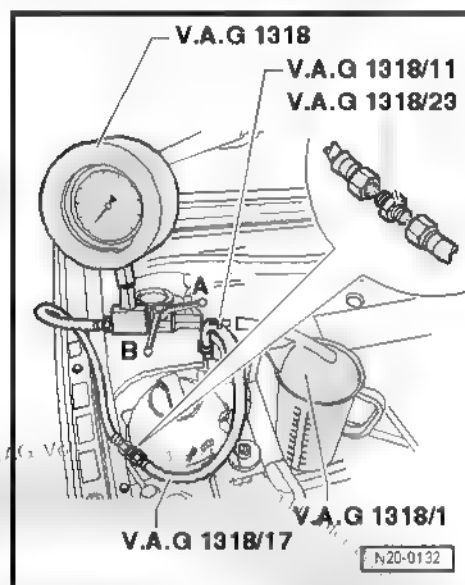
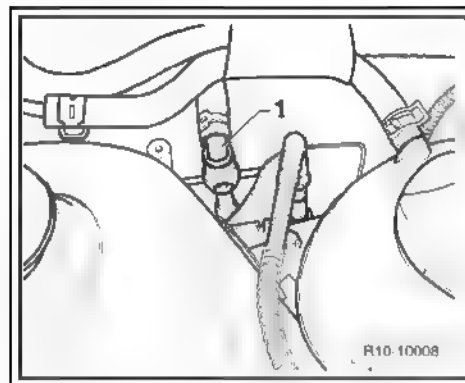


#### WARNING

Fuel supply hoses are under pressure. Wrap hose connection with cloth prior to loosening. Next, eliminate pressure by carefully removing hose.



- Disconnect the fuel supply hose connection -1- and clean the spilled fuel with a cloth.
- Connect the Pressure gauge - VAG 1318- to the fuel supply line, using the connection adapters from the Adapter set - VAG 1318/23- and Adapter set - VAG 1318/17- .
- Couple the hose of the Pressure Gauge - VAG 1318- to the Adaptor - VAG 1318/11- and Adaptor - VAG 1318/1- from the verification Pressure Gauge - VAG 1318- and place its end in a 3.0 l flask.
- Open the Pressure gauge valve - VAG 1318- . It will indicate the flow direction -A-.
- Actuate the Remote control - VAG 1348A- , slowly closing the valve, until the Pressure Gauge - VAG 1318- shows a positive pressure of 3.0 bar on vehicles manufactured up until May/2006, and 4.0 bar on vehicles manufactured as of June/2006. From this moment on, do not change the position of the valve.
- Empty measuring container.
- The flow of the Fuel system pressurisation pump - G6- depends on the Battery voltage - A- . Therefore connect the Multimeter - VAG 1715- to the vehicle Battery - A- , using the Auxiliary Cables - VAG 1594A- .
- Activate the Remote control - VAG 1348A- for 30 seconds, measuring the Battery voltage - A- .
- Compare the fuel flow with the theoretical value for vehicles manufacture until May/2006 (pressure of the Fuel pump (pre-supply pump) - G6- 3 bar).







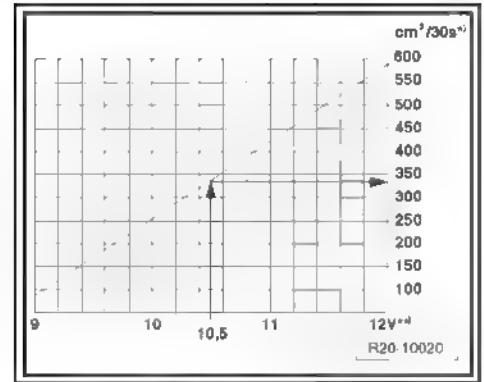
- Compare the fuel flow with the theoretical value for vehicles manufacture since June/2006 (pressure of the Fuel pump (pre-supply pump) - G6- 4 bar).

8) Minimum amount  $\text{cm}^3/30 \text{ s}$

9) Voltage at the Fuel system pressurisation pump - G6- with the engine at rest and running Fuel system pressurisation pump - G6- (approx. 2 volts below the Battery - A- voltage)

Example of a reading:

During the test, a voltage of 12.5 volts is measured on the Battery - A- . As the Fuel system pressurisation pump - G6- operates at approx. 2 V below the Battery - A- voltage, this results in a minimum supply flow rate of  $633 \text{ cm}^3/30 \text{ s}$  in vehicles manufactured until May/2006 and  $333 \text{ cm}^3/30 \text{ s}$  in vehicles manufactured as of June/2006



If minimum fuel quantity is not reached:

- Check if the supply pipes to the filter present folds or obstructions.

If fuel pipes are in order.

- Check fuel flow before fuel filter.



#### WARNING

*Fuel supply pipes are under pressure! Before loosening hose connections, put a cleaning cloth on connection points. Then depressurize by carefully pulling the hose.*



#### Note

*Press the keys on hose connectors.*



- Remove the supply hose -1- from the fuel filter inlet and connect it to Adapting set - VAG 1318/17-.
- Pressure gauge - VAG 1318- with Adapting set - VAG 1318/17- as shown.
- Install the Adapter - V.A.G 1318/16- onto the Pressure gauge - VAG 1318- Adapter - V.A.G 1318/11- and place its end in a graduated container with a capacity for at least 3.0-litres.
- Open the Pressure gauge valve - VAG 1318- . The key points towards the fuel passage-A-.
- Actuate the Remote control - VAG 1348/3A- , slowly closing the valve, until the Pressure Gauge - VAG 1318- shows a positive pressure of 3.0 bar on vehicles manufacture up until May/2006, and 4.0 bar on vehicles manufactured as of June/2006. Do not change the valve position.
- Empty measuring container.
- Check flow again.
- Activate the Remote control - VAG 1348/3A- once more for 30 seconds. Compare the flow value with the one obtained in the first measurement.

If minimum flow is achieved:

- Replace fuel filter.

If the minimum flow is not reached again:

- Remove the Fuel pump (pre-supply pump) - G6- and check whether there is dirt in the screen filter.

Only if no irregularities have been found so far:

- Fuel pump (pre-supply pump) - G6- - damaged, replace it  
⇒ [page 77](#) .

If the **desired** fuel flow is achieved, but at great cost, we may conclude that the fuel supply presents some irregularity (i.e. a temporary fuel supply failure):

- Couple the fuel line that have been removed again.
- Using the current clamp, connect the Multimeter - VAG 1715- to contact 1, of the 4-pole connection socket (blue/white) -arrow- of the wiring harness.
- Start engine and keep it idle.
- Measure current draw by the Fuel pump (pre-supply pump) - G6- .

Theoretical value: 6.8 ampère at the most for vehicles manufacture until May/2006 and 7.6 ampère for vehicles manufacture since June/2006.

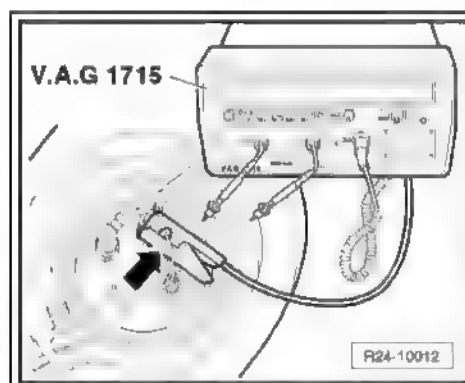
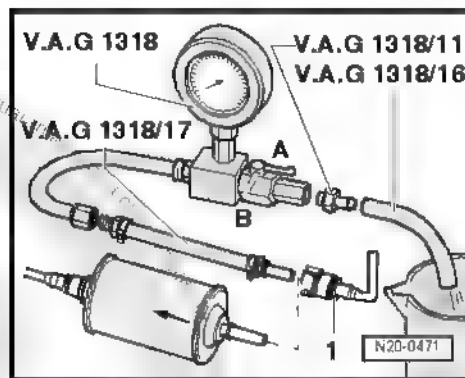


#### Note

*If it is a temporary irregularity of the fuel system, the verification can also be made during a test drive, in which case the intervention of a second person is required.*

If the current draw is excessive:

- Fuel pump (pre-supply pump) - G6- - damaged, replace it.





### 1.8.6 Fuel pump (pre-supply pump) - G6- check valve - examine

### 1.8.7 Test conditions

- Remote control - VAG 1348/3A- and Adapter cable - VAG 1348/3-2- connected

### 1.8.8 Test sequence



#### WARNING

*Fuel supply pipes are under pressure! Before loosening hose connections, put a cleaning cloth on connection points. Then depressurize by carefully pulling the hose.*



#### Note

*This test should confirm simultaneously tightness of fuel supply lines and joints, from the Fuel pump (pre-supply pump) - G6- until the location of the Pressure gauge - VAG 1318- junction.*

- Remove supply hose -1- from the fuel filter inlet and connect it to the Adapter set - VAG 1318/17- and the Pressure gauge - VAG 1318- .



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- Install the Adapter - VAG 1318/16- on the Adapter - VAG 1318/11- of the Pressure gauge - VAG 1318- and put the hose end in a graduated container



#### Note

For that, press the keys on hose connectors

- Close the Pressure gauge - VAG 1318- valve (valve handle in transverse to flow position - position -B-).
- Activate the Remote control - VAG 1348/3A- in quick consecutive intervals until reaching a pressure of approx. 3.0 bar for vehicles manufacture until May/2006 and 4.0 bar for vehicles manufacture since June/2006.



#### WARNING

*Risk of splashes when opening the passage key; keep a container in front of the free end of the Pressure gauge - VAG 1318-.*

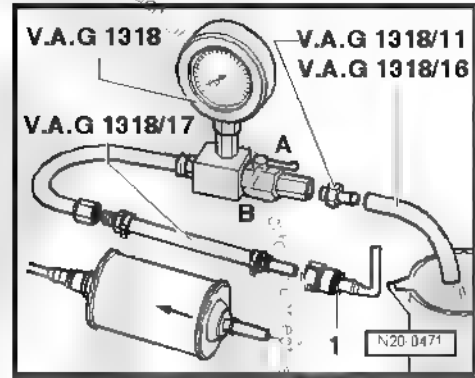
- Remove possible excessive pressure by opening the valve carefully.
- Check the pressure drop on the Pressure gauge - VAG 1318-. After 10 minutes, the pressure should not have dropped below 2.0 bar.

If the pressure keeps dropping:

- Check the joints for tightness.

If no irregularities are found in the pipes:

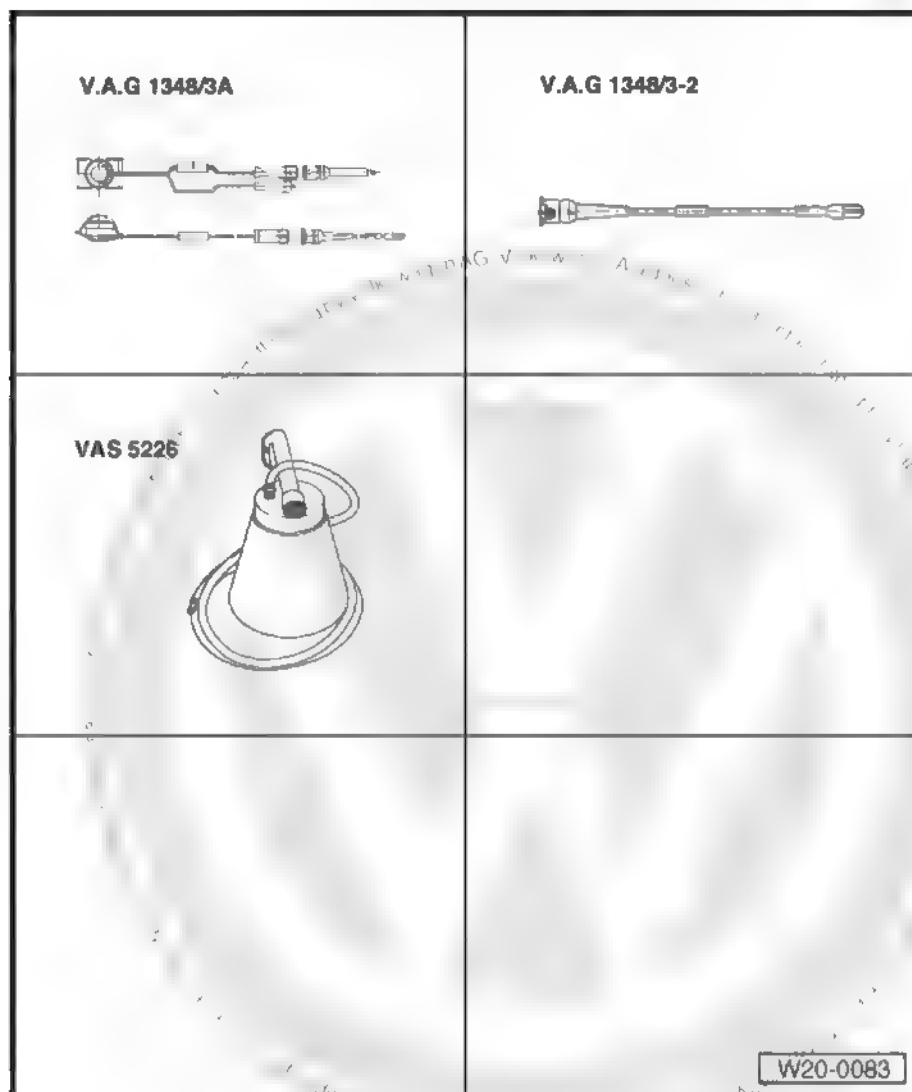
- Fuel pump (pre-supply pump) - G6- - damaged, replace it.



## 1.9 Feeding system - drain the air



Special tools and workshop equipment required



- ◆ Remote control - VAG 1348/3A- and Adapter cable - VAG 1348/3-2- connected.
- ◆ Gas oil aspirator - VAS 5226-
- ◆ Adapter - V.A.G 1318/20-
- ◆ Adapter - V.A.G 1318/20-1-

### 1.9.1 Conditions

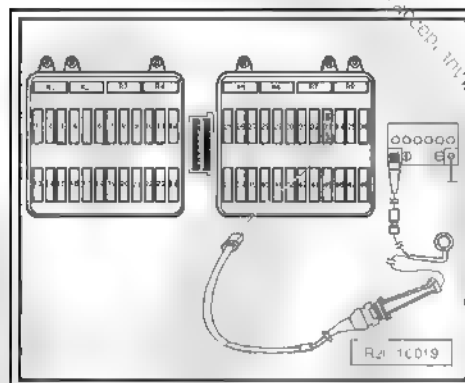
- The fuses must be OK.
- The Battery - - voltage must be at least 11.5 V.
- The Fuel pump relay - J17- has to be OK.

### 1.9.2 Operation sequence

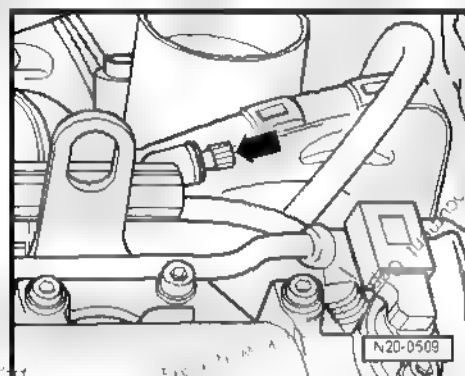
- Remove fuse holder cover.
- Remove fuse 33 from the ( Fuel pump (pre-supply pump) - G6- ) fuse holder.



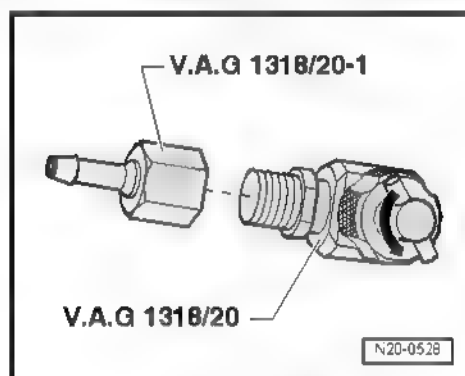
- Connect the Remote control - VAG 1348/3A- and the Adapter cable - VAG 1348/3-2- to the bottom contact of the Fuel system pressurisation pump - G6- fuse 33 and to the positive (+) terminal of the Battery - A- .



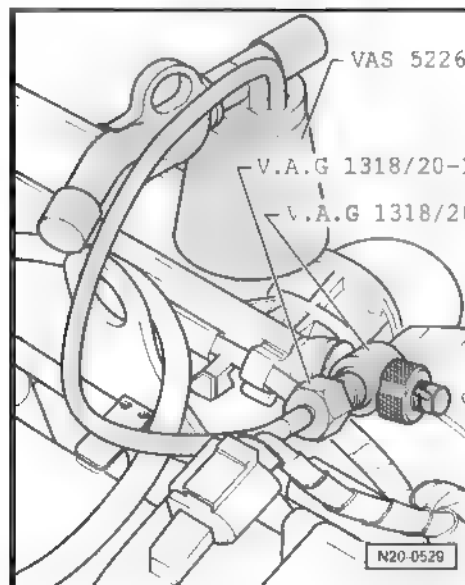
- Remove the protection cover -arrow- of the drain valve.



- Install the Adapter - VAG 1318/20-1- in the Adapter - VAG 1318/20- .
- Turn the valve (in the T-shaped part) counterclockwise until it opens fully.



- Manually install the Adapter - VAG 1318/20- in the drain valve.
- Connect the pipe of the Diesel aspirator - VAS 5226- as shown.
- Turn the valve (T-shaped part) clockwise up to the stop of the drain valve.
- Check the adapter and the connections of the pipes for leaks.
- Actuate the Remote control - VAG 1348/3A- until fuel without bobbles comes out of the drain valve.
- Turn the valve (in the T-shaped part) counterclockwise until it opens fully.
- Check the hose of the Diesel aspirator - VAS 5226- (for example, with tube clamps up to Ø 25 mm - 3094- ) and remove it from the Adapter - VAG 1318/20-1- .
- Remove the Adapter - VAG 1318/20- from the drain valve.



## 2 Activated charcoal filter system

Operation ➔ [page 93](#) .

Activated charcoal filter system components - repair  
➔ [page 93](#) .

Check fuel tank ventilation ➔ [page 94](#) .

### 2.1 Operation

Fuel vapors form over the surface of the fuel in the tank, and the amount of fuel vapor present depends on air pressure and environmental temperature.

The activated charcoal filter system prevents that those emissions of hydrocarbons are released into the atmosphere.

The fuel vapors from the highest point in the tank pass by the gravity valve (it closes at a 45° inclination) and by the retention valve, choked in their quantity, to the activated charcoal filter.

The activated charcoal absorbs these vapours like a sponge.

While driving and with the active Lambda regulation (hot engine), the electromagnetic valve 1 of the activated charcoal filter system - N80- , (also known as regeneration valve) is cyclically excited by the Engine control unit - J623- , according to the rotation and load. The opening period depends on the input signals.

Intake manifold vacuum aspirates fresh air through the ventilation opening on the lower part of the activated charcoal filter during the regeneration process of the activated charcoal. The fuel vapours stored in the activated charcoal and the fresh air are fed for combustion in controlled quantities.

The retention valve prevents the fuel vapors from being aspirated from the tank, when the Magnetic valve 1 for activated charcoal filter - N80- opens and there is a vacuum in the intake manifold. Accordingly, this ensures the regeneration of the activated charcoal filter.

In the absence of current (e.g. harness interruption), the Magnetic valve 1 for the activated charcoal system - N80- remains closed. The activated charcoal filter will not be purged.



#### Note

- ◆ *The junctions of the flexible tubes are fastened with quick coupling clamps.*
- ◆ *Always replace tightening clamps with spring clamps.*
- ◆ *To install spring clamps, we recommend using the Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- .*

Follow safety measures ➔ [page 76](#)

Follow cleaning rules ➔ [page 76](#) .

### 2.2 Activated charcoal filter system components - repair



1 - Activated charcoal filter re-generation system's hose

2 - Pressure retention valve with connection hose

- ☐ Make sure it is well fastened
- ☐ From the gravity valve.

3 - Activated charcoal filter

- ☐ Installation location: in the right rear wheel case.

4 - Vent connection

- ☐ Ventilation visible from below.

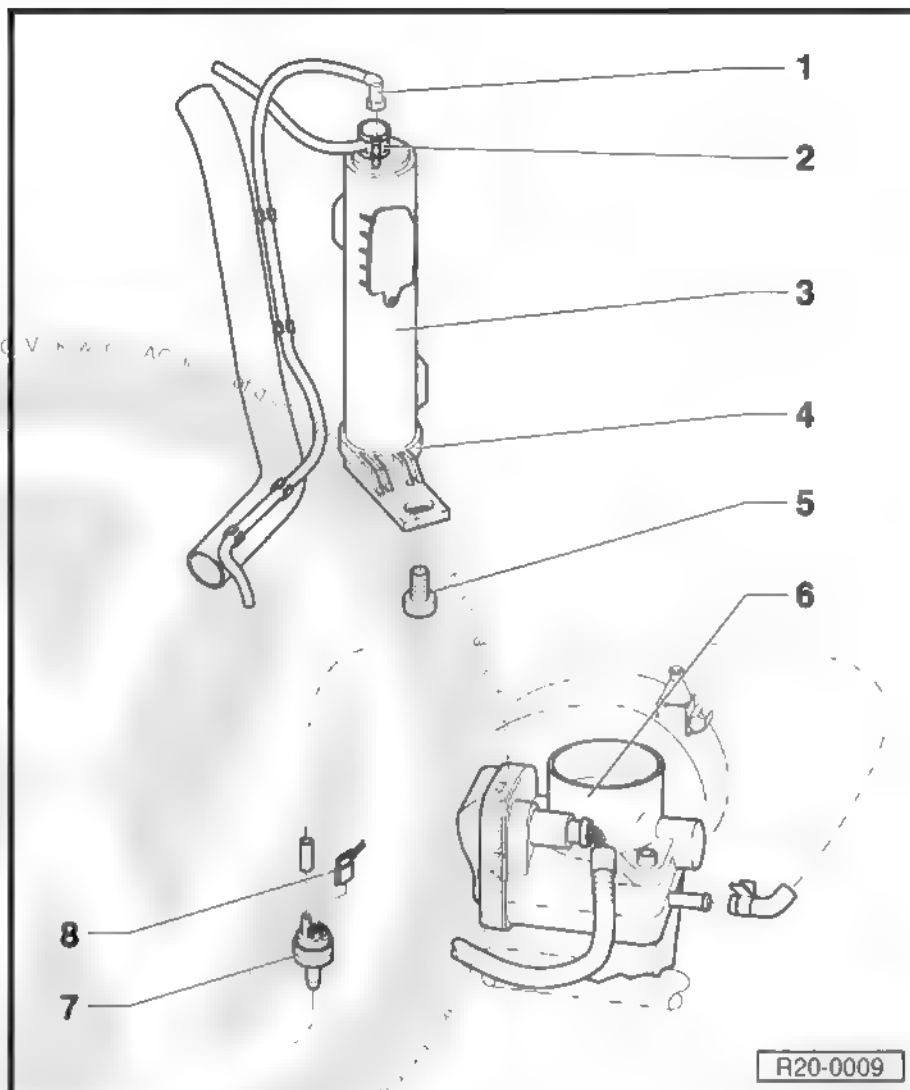
5 - 10 Nm

6 - Throttle valve control unit - J338-

7 - Magnetic valve 1 for activated charcoal reservoir - N80-

- ☐ The Magnetic valve 1 for the activated charcoal reservoir - N80- will close when the ignition is off.
- ☐ The Magnetic valve 1 for the activated charcoal reservoir - N80- is activated (by pulses) via Engine control unit - J623-, when the engine is at the operating temperature.

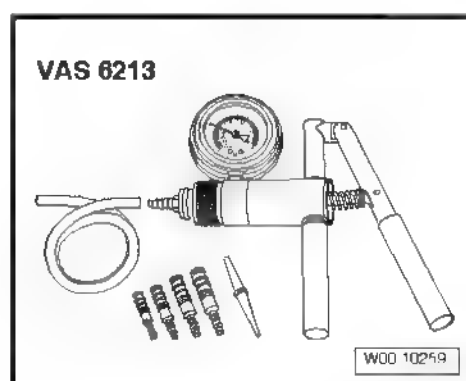
8 - Connector



## 2.3 Fuel tank ventilation - check

Special tools and workshop equipment required

- ♦ Vacuum pump - VAG 1390- or Vacuum pump - VAS 6213-



### 2.3.1 Test conditions

- The ignition must be OFF





### 2.3.2 Test sequence

- Remove the regenerations flexible hose -1- from the activated charcoal filter on the electromagnetic valve 1 for the activated charcoal filter - N80- -2-
- Install the Vacuum pump - VAG 1390- or Vacuum pump - VAS 6213- as illustrated, the flexible hose -1-.
- Operate the Vacuum pump - VAG 1390- or Vacuum pump - VAS 6213- several times. Vacuum can not be generated

If vacuum is generated:

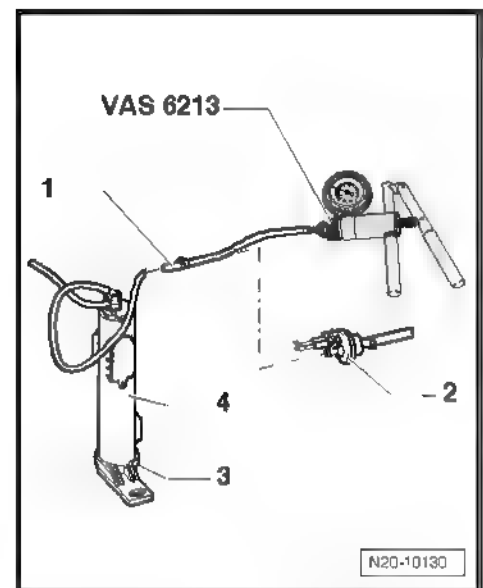
- Check ventilation opening -3- in the lower part of the activated charcoal filter -4- as for impurities and clean, if necessary.

If vacuum is not generated:

- Block ventilation opening -3- and run the Vacuum pump - VAG 1390- or Vacuum pump - VAS 6213- several times again. Vacuum must be generated.

If vacuum is not generated:

- Replace the activated charcoal filter.





### 3 Engine power electronic adjustment (electronic accelerator)

Operation ➤ [page 96](#) .

Engine power electronic adjustment (electronic accelerator)  
➤ [page 96](#) .

#### 3.1 Operation

In the electronic accelerator, the throttle valve is not activated by a cable. There is no mechanical connection between the accelerator and the throttle valve.

The position of the accelerator is transmitted to the Engine control unit - J623- by two accelerator position sensors (variable resistance; stored in a housing), which are connected to the accelerator.

The position of the accelerator (at the driver's criterion) is the main input value for the Engine control unit - J623- .

The throttle valve is activated by an electric engine (butterfly element) incorporated to the Throttle valve control unit - J338- , in all load and rotation intervals.

The throttle valve is activated by a butterfly element, according to data provided by the Engine control unit - J623- .

With the engine turned off and the ignition connected, the Engine control unit - J623- activates the butterfly element, due to the data provided by the Accelerator pedal position sensor - G79- . This means that if the accelerator is half activated, the butterfly element will open proportionally, that is, the throttle valve will be half opened.

With the engine running (loaded), the Engine control unit - J623- may open or close the butterfly, regardless of the Accelerator pedal position sensor - G79- .

Accordingly, the throttle valve may, for instance, be completely open already, even if the accelerator is only half activated. The benefit is being able to avoid losses from choking, caused by the throttle valve.

Furthermore, this enables lower fuel consumption and emissions of pollutants for certain load conditions.

The necessary torque may be obtained by the Engine control unit - J623- , through an optimal combination between the throttle valve opening and the over-supply pressure.

Believing that the "electronic accelerator" comprises only one or two components would be a mistake. The electronic accelerator is a system comprised of all the components that contribute to determining the position of the butterfly valve, in order to adjust it and activate it, such as for example, the Accelerator pedal position sensor - G79- , the Accelerator butterfly valve command unit - J338- , the "E-gas" system fault warning light - K132- , the Engine control unit - J623- , etc).

#### 3.2 Engine power electronic adjustment (electronic accelerator)



1 - Pedals support

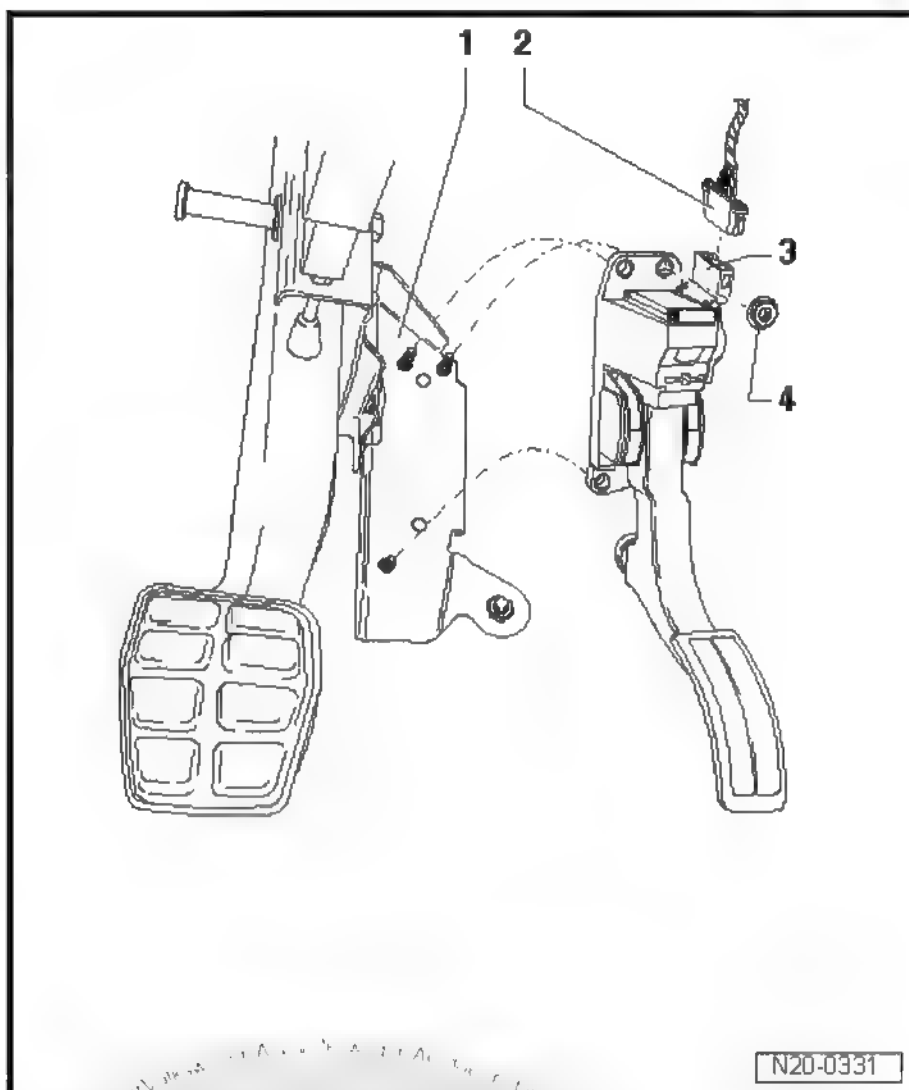
2 - Connector

□ Black, 6 poles

3 - Accelerator pedal position sensor - G79- and Accelerator pedal position sensor 2 - G185-

□ To remove, loosen the connections and disconnect the connector

4 - 10 Nm





## 24 – Mixture preparation - injection

### 1 Injection system

General instructions regarding the injection system

- ◆ The Engine control unit - J623- is equipped with a self-diagnosis system. Before repairing and troubleshooting, always check the failures memory first. Likewise, check vacuum hoses and connections (air infiltration).
- ◆ A minimum voltage of 11.5V is necessary for the correct operation of electrical components.
- ◆ Do not use silicon sealants. Silicone component residues sucked in by the engine do not burn and may damage the Lambda Probe - G39- .
- ◆ The vehicles with airbag have a fuel interruption system in case of accident. This system should prevent vehicle fire after an accident, turning off the Fuel pump (pre-supply pump) - G6- through the Fuel pump relay - J17- . At the same time, this piece of equipment also increases comfort at the engine start.

Fuel injection components - remove and install ⇒ [page 101](#) .

Intake manifold - remove and install ⇒ [page 103](#) .

Fuel distributor with injectors - remove and install ⇒ [page 104](#) .

Air filter set - assemble and disassemble ⇒ [page 104](#) .

Air filter assembly - remove and install ⇒ [page 105](#) .

Safety measures ⇒ [page 106](#) .

Cleaning rules ⇒ [page 76](#) .

Technical data ⇒ [page 108](#) .

#### 1.1 Component location





**A - Brake pedal switch - F47-  
or Brake light switch - F-**

- ☐ Together in one body, in the feet compartment, on the brake pedal.

**B - Accelerator pedal position sensor - G79- and Sensor 2 of accelerator pedal position - G185-**

- ☐ At the feet compartment, on the accelerator pedal.

**C - Clutch pedal switch - F36-**

- ☐ In feet compartment, on clutch pedal.

**D - Fuel pressure regulator**

- ☐ On the Fuel pump (pre-supply pump) - G6- .

**1 - Solenoid valve 1 for activated charcoal reservoir - N80-**

- ☐ Engine compartment.

**2 - Intake manifold**

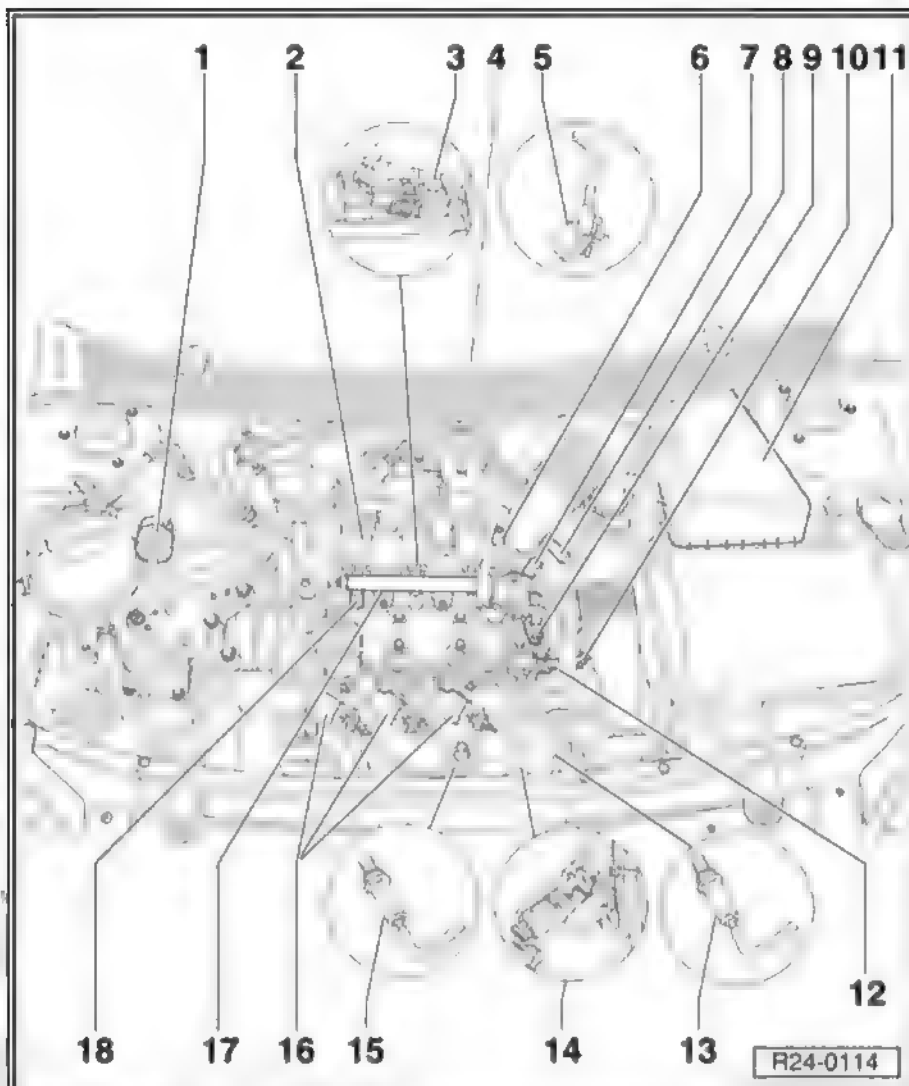
- ☐ Remove and install  
⇒ [page 103](#) .

**3 - Knock sensor 1 - G61-**

- ☐ Installation location: On engine block, intake side.

**4 - Engine control unit - J623-**

- ☐ Below the lower wind-screen covering .
- ☐ Remove and install





→ [page 116](#) .

5 - Engine speed sensor - G28-

☐ Installation location: On engine block, intake side

6 - Intake air temperature sensor - G42- with Intake manifold pressure sensor - G71-

7 - Aeration hose valve

8 - Throttle valve control unit - J338-

9 - Tank pressure sensor - G40-

10 - Coolant temperature sensor - G62-

11 - Air cleaner

☐ Remove and install → [page 105](#) .

12 - Oil pressure switch - F1-

13 - Lambda probe behind catalytic converter - G130-

14 - 4-contact connector

☐ Black

☐ To the Lambda probe - G39- and Lambda probe heating - Z19- .

15 - Lambda probe - G39-

16 - Ignition coil 1 with final power stage - N70- , Ignition coil 2 with final power stage - N127- and Ignition coil 3 with final power stage - N291-

17 - Fuel distributor

18 - Cylinder 1 injector - N30- , Cylinder 2 injector - N31- and Cylinder 3 injector - N32-





## 1.2 Fuel injection components - remove and install

### 1 - Air filter set

- ☐ With filtering element.
- ☐ Disassemble and assemble → [page 104](#)
- ☐ Remove and install → [page 105](#).

### 2 - Duct for air aspiration

### 3 - Injection valve wiring harness

### 4 - Connector

- ☐ Black, 2 poles
- ☐ From Cylinder 1 injection valve - N30-.
- ☐ From Cylinder 2 injection valve - N31-.
- ☐ From Cylinder 3 injection valve - N32-.

5 - 10 Nm

### 6 - Fuel rail with injection valves

- ☐ Remove and install → [page 104](#).

7 - 20 Nm

8 - 20 Nm

### 9 - Intake manifold

- ☐ Remove and install → [page 103](#)

### 10 - Lambda probe - G39-

- ☐ 50 Nm
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- the High-temperature paste - G 052 112 A3- must not penetrate the grooves on the body of the Lambda probe - G39-.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337-.

### 11 - Connector

- ☐ Black, 4 poles.
- ☐ From Lambda probe - G39-.

### 12 - From Lambda probe after catalyser - G130-

- ☐ 50 Nm
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- the High-temperature paste - G 052 112 A3- must not penetrate the grooves on the body of the Lambda probe after catalyzes - G130-.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337-.

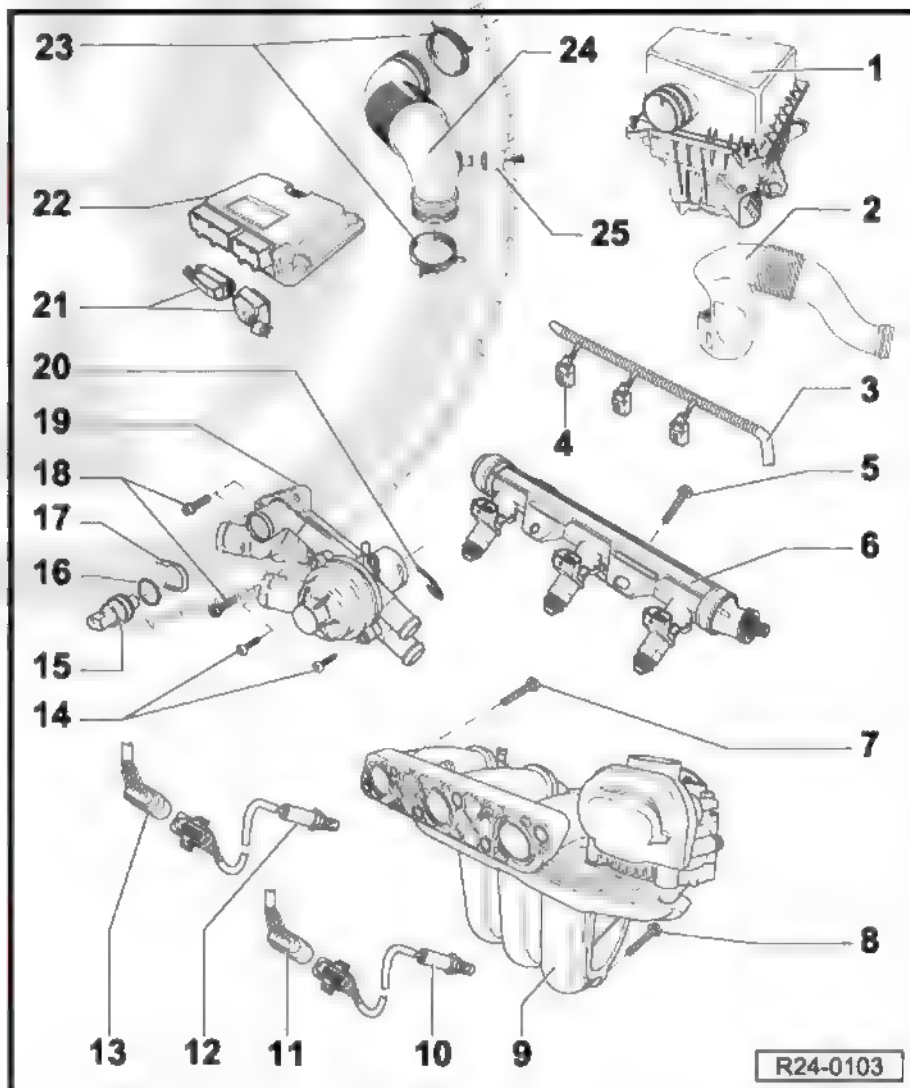
### 13 - Connector

- ☐ Black, 4 poles.
- ☐ From Lambda probe after catalyzer - G130-.

14 - 10 Nm

### 15 - Coolant temperature sensor - G62-

- ☐ Before removing, eliminate cooling system pressure, if necessary.





- ☐ 2-pole connector.

16 - Seal

- ☐ Replace if damaged

17 - Retaining clip

- ☐ Check as for the correct seating.

18 - 10 Nm

19 - Thermostat valve housing

20 - Retaining clip

- ☐ Check as for the correct seating.

21 - Connection connector

- ☐ Disconnect or connect the connector only while the ignition is switched off.

22 - Engine control unit - J623-

- ☐ Remove and install ⇒ [page 116](#)

- ☐ In case of replacement, it is necessary to adapt the Engine control unit - J623- to the Immobilizer control unit - J362- ⇒ Vehicle diagnostic tester.

23 - Spring clamp

24 - Air duct

25 - From the cylinder head cover





## 1.3 Intake manifold - remove and install

1 - 10 Nm

2 - Throttle valve control unit - J338-

- ☐ 6-pole connection connector.
- ☐ Gold-plated contacts.
- ☐ Heated cooling system.
- ☐ In case of replacement, adapt the Engine control unit - J623- to the Accelerator butterfly valve control unit - J338-  
⇒ Vehicle diagnostic tester.

3 - Gasket

- ☐ Renew after each removal.

4 - Connection nozzle

- ☐ From oil separator.

5 - Connection nozzle

- ☐ From the Solenoid valve 1 for activated charcoal filter - N80-.

6 - Seal

- ☐ Replace if damaged.

7 - 20 Nm

8 - 3 Nm

9 - Intake collector pressure sensor - G71- with Air temperature sensor - G42-

- ☐ 4-pole connection connector.
- ☐ Gold-plated contacts.

10 - Seal

- ☐ Replace if damaged.

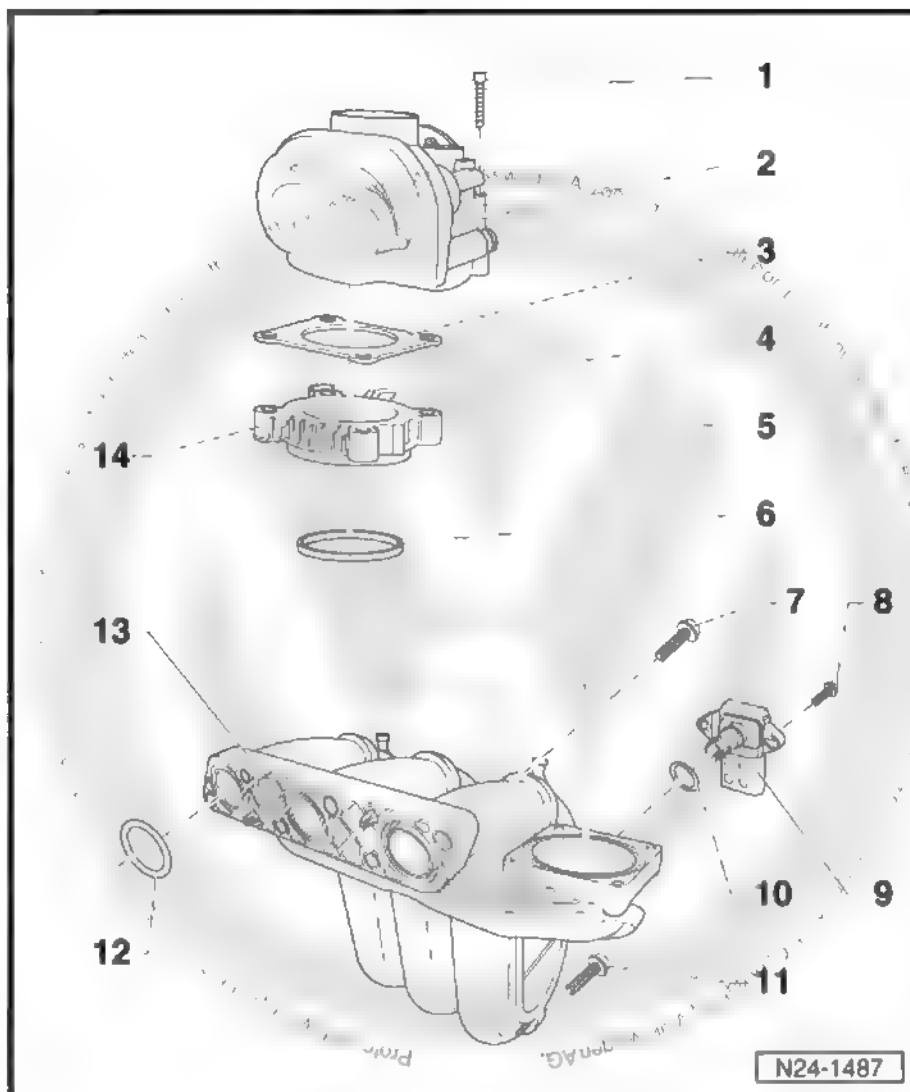
11 - 20 Nm

12 - Seal

- ☐ Replace if damaged

13 - Intake manifold

14 - Intake nozzle





## 1.4 Fuel distributor with injectors - remove and install

### 1 - Fuel rail with injection valves

- ☐ Check tightness and flow of the injection valves ➔ [page 109](#) .

### 2 - Seal

- ☐ Renew after each removal.
- ☐ Slightly lubricate with clean engine oil before installation.

### 3 - From Cylinder 1 injection valve - N30-

- ☐ From Cylinder 2 injection valve - N31- .
- ☐ From Cylinder 3 injection valve - N32- .
- ☐ Check tightness and flow rate of the injection valves ➔ [page 109](#) .

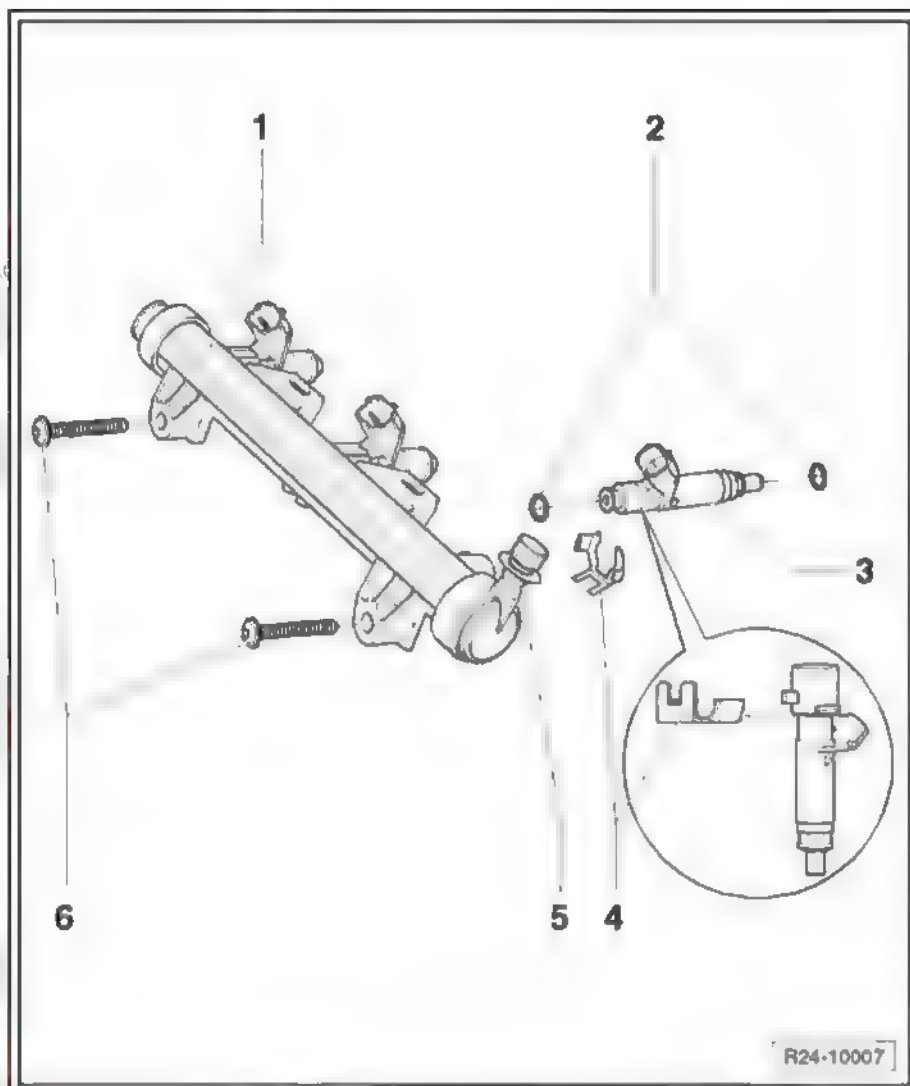
### 4 - Retaining clip

- ☐ Make sure its proper seating in the injection valve and fuel rail.

### 5 - Drain valve

- ☐ Drain the air ➔ [page 90](#) .

### 6 - 10 Nm



## 1.5 Air filter set - assembly overview



### Note

- ◆ For fixation of the upper part of the air filter in the inferior part a series of fine thread screws is used. If these screws are loosened or tightened with a power screwdriver, the threads on the lower part of the air filter can be damaged.
- ◆ Due to that, a power screwdriver can only be used if:
- ◆ the power screwdriver's rotation speed does not exceed 200 rpm
- ◆ a torque of 1.6 Nm at most is adjusted.



1 - Upper part of filter air

2 - 1.6 Nm

3 - Filtering element

4 - Lower part of filter air

5 - 8 Nm

6 - Metal-rubber bearing

7 - 5 Nm

8 - Rubber bearing

9 - Duct for air aspiration

10 - Rubber bearing

11 - Hose

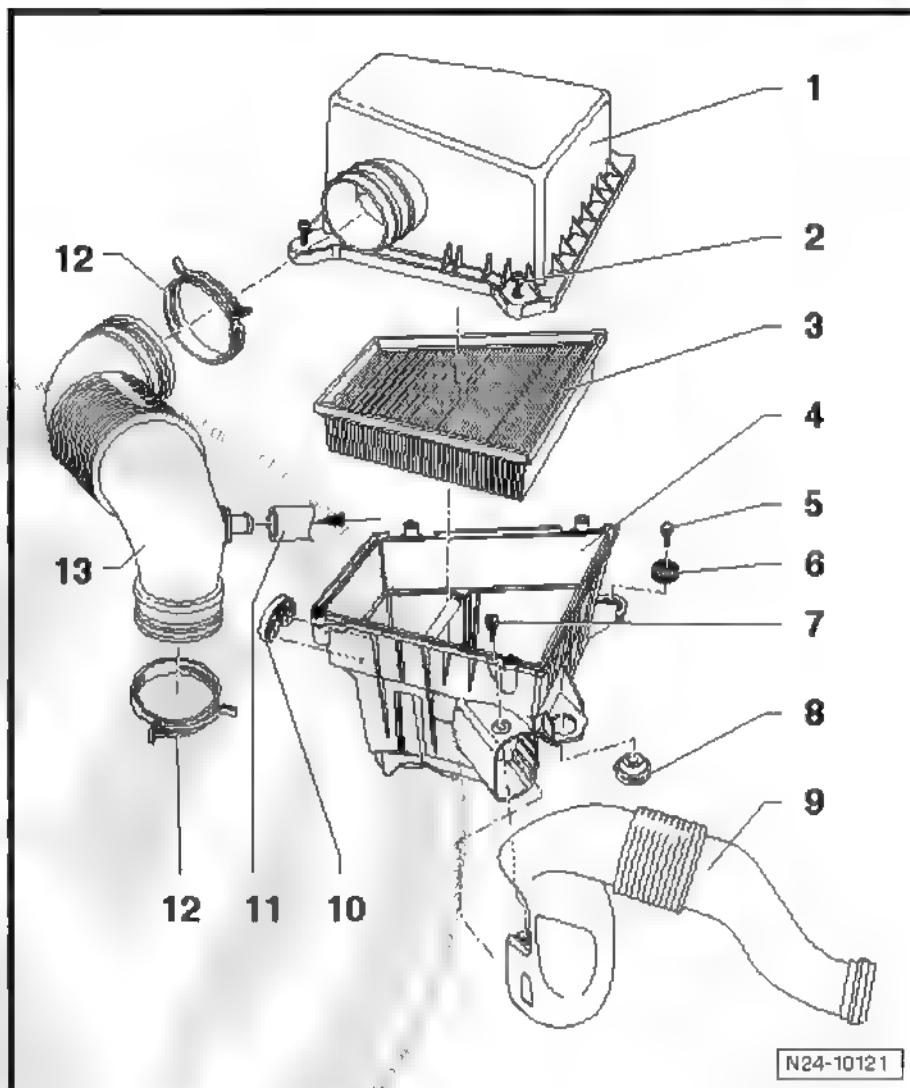
☐ From engine cylinder head cover.

12 - Clip

☐ Remove with VAS 5024A or Standard type clamp pliers - VW 5162-.

13 - Air duct

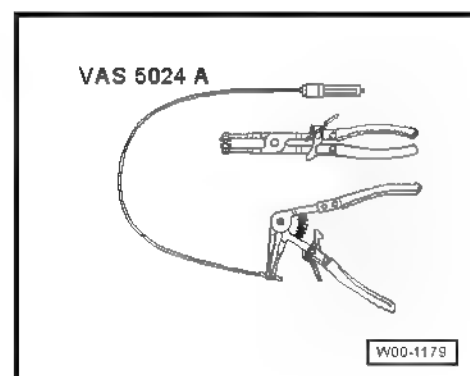
☐ To the Accelerator butterfly valve control unit - J338-.



## 1.6 Air filter assembly - remove and install

Special tools and workshop equipment required

◆ VAS 5024A or Standard-type clamp pliers - VW 5162-



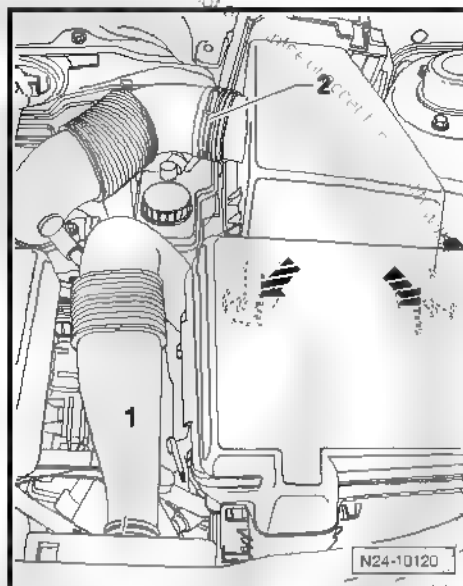


### Removal

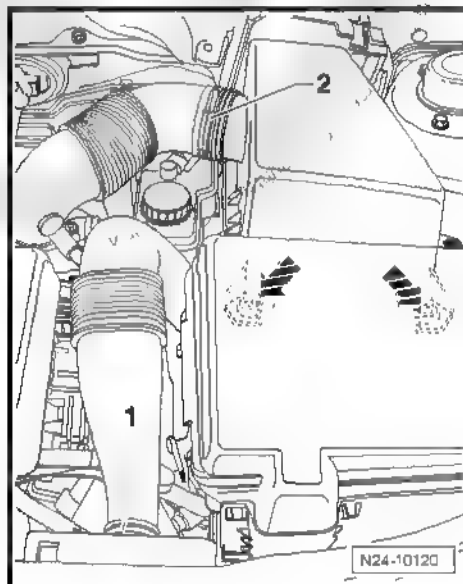
- Pull off intake air duct -1-.
- Loosen spring clamp -2- with the VAS 5024A or Standard type clamp pliers - VW 5162- and pull of air duct from the upper part of filter air set
- Remove left fastening bolt -arrows- for the air filter set.
- Tilt the Battery - A- cover forward
- Move the air filter set upwards
- Remove air filter set

### Installation

- Seat air filter set on the rubber supports -arrows-.



- Press air filter set downwards onto the pins.
- Tighten fastening screws to 8 Nm.
- Fasten the air duct with the spring clamp on the upper part of the air filter set -2-.
- Install intake air duct on intake nozzle -1-.



## 1.7 Safety measures



### WARNING

*Fuel system is under pressure! Wear goggles and protection cover, so as to prevent serious injuries and contact with the skin. Before loosening the tube connections, wrap the connection points with cloth. Then eliminate the pressure, carefully pulling the flexible tube.*

To prevent personal injuries an/or the destruction of the injection and ignition system, the following must be taken into account

- ◆ Due to safety reasons, before opening the fuel system, remove fuse number 33 from the fuse box, as the Fuel pump (pre-supply pump) - G6- can be activated
- ◆ Do not touch the ignition cables or turn them off with the engine running or at start.



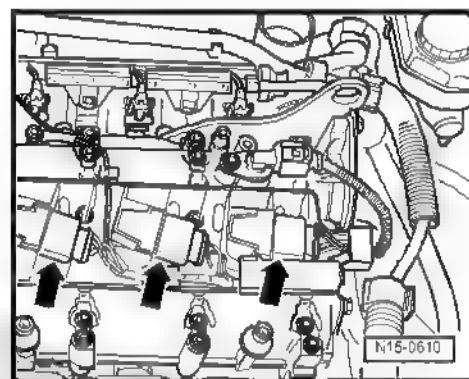
- ◆ Only connect or disconnect the injection and ignition system cables, including measuring device cables, with the ignition switched off.

If, during a drive test, it is necessary to use measuring and test equipment, consider the following

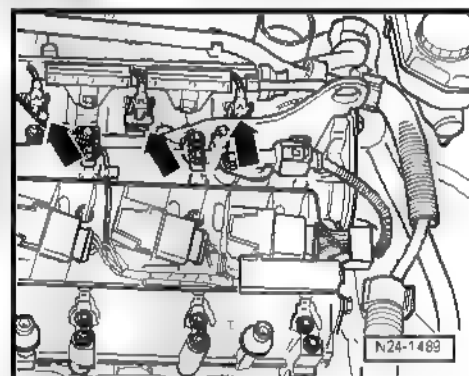
- ◆ The measuring and test equipment must always be fastened to the back seat and operated from there by another mechanic.

If the measuring and test equipment are operated from the front passenger seat, the person sitting there might be hurt due to the activation of the passenger airbag in case of accident.

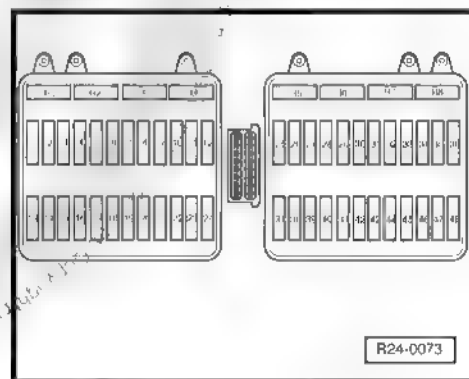
- ◆ In case there is the intention of turning the engine with the starter, without operating the engine:
  - Disconnect the 4-pole connectors from the Ignition coil 1 with final power stage - N70- , Ignition coil 2 with final power stage - N127- and Ignition coil 3 with final power stage - N291- -arrows-.



- Disconnect connection connectors -arrows- from the Cylinder 1 injector - N30- , Cylinder 2 injector - N31- and Cylinder 3 injector - N32-.



- Remove fuse 33 from the fuse holder.



## 1.8 Cleaning rules

To perform works in the fuel supply/injection, the following "5 cleaning rules" must be carefully respected:

- ◆ Carefully clean the union points and surrounding surfaces before separating them
- ◆ Place parts on clean base and cover them. Do not use cloths that fray!



- ◆ Cover or carefully close open parts should repair not be carried out immediately.
- ◆ Install only parts that are clean: Remove parts from the packaging immediately before their installation. Do not use parts that have been stored outside the package (for example, in tool boxes)
- ◆ With system open: Do not work with compressed air. Do not move the vehicle.

## 1.9 Technical data

Engine codes	BMD/CHFB/CHFA	
Idle speed check		
Idle speed rotation <sup>12)</sup>	rpm	650...870 <sup>11)</sup>
Engine control unit - J623- <sup>13)</sup>		
System	Simos 3PG <sup>10)</sup>	
Part number	⇒ EPC (Electronic Parts Catalogue)	
Speed limitation	rpm	from about 5800

10) Simos 3 PG installed up to week 29, Simos 9.1 started in week 30.

11) Current values: ⇒ Inspection of exhaust gases

12) Non-adjustable.

13) Remove and Install the Engine control unit - J623- ⇒ [page 116](#).



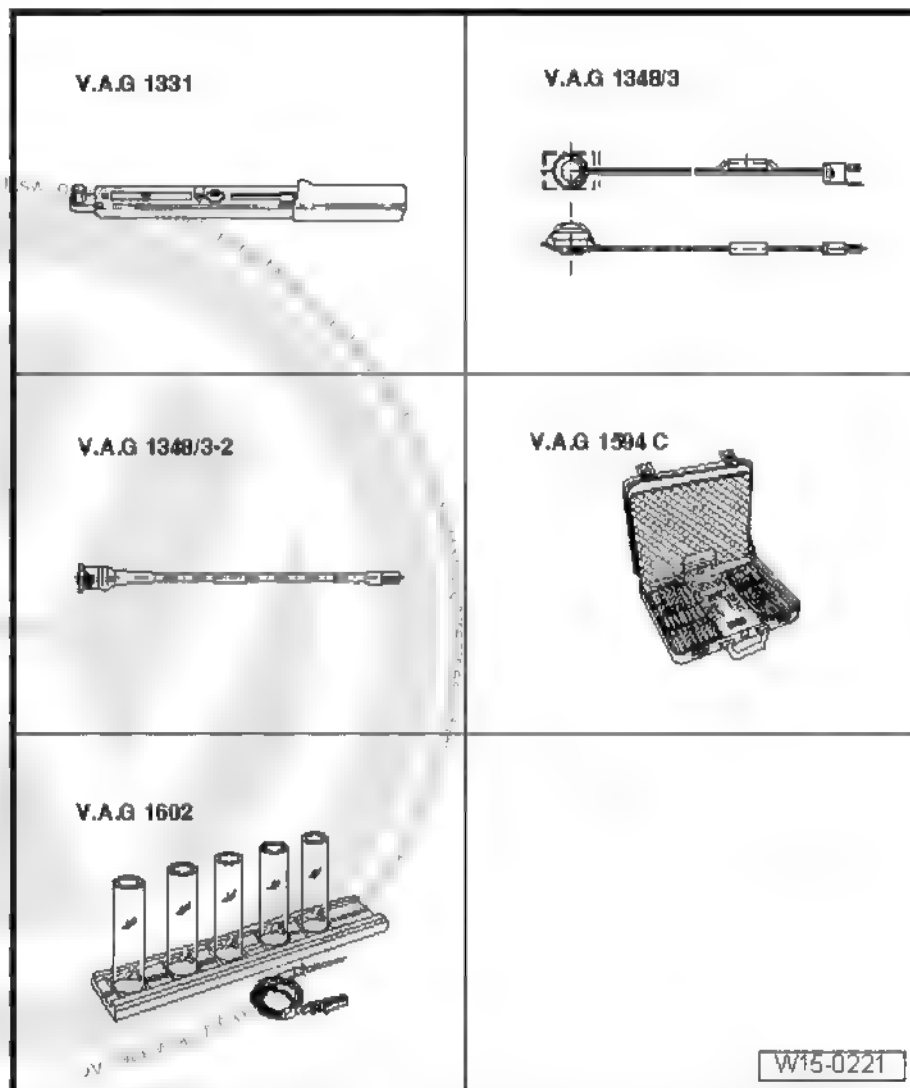
## 2 Check the components

Check the injection valves → [page 109](#) .

Check the regulator of fuel pressure and the residual pressure  
→ [page 111](#) .

### 2.1 Injection valves - check

Special tools and workshop  
equipment required



- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Remote control - VAG 1348A-
- ◆ Auxiliary measuring cable set - VAG 1594C-
- ◆ Flow meter - VAG 1602-

#### 2.1.1 Tightness and the flow of the injection valves - check

#### 2.1.2 Check conditions

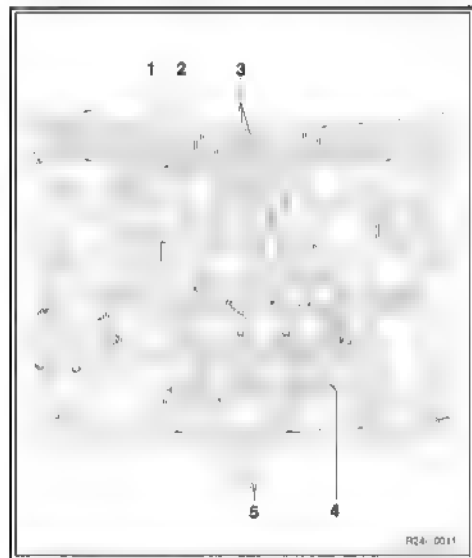
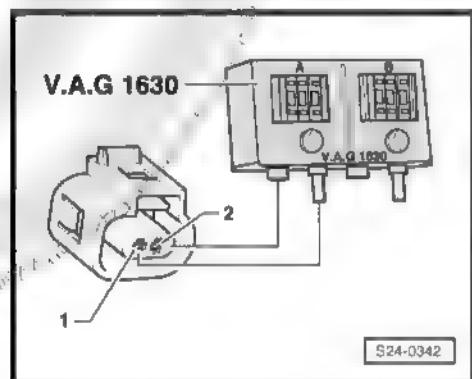
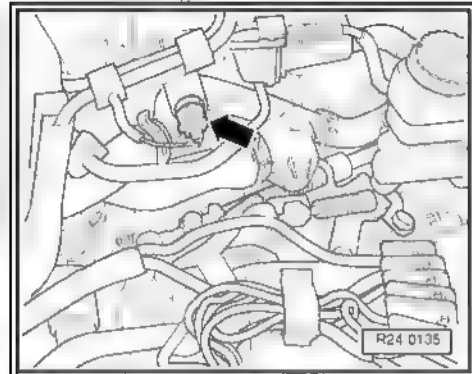
- The fuel's pressure has to be OK → [page 111](#) .



- Residual pressure and fuel pressure regulator - check  
➔ [page 111](#) .

### 2.1.3 Checking process

- Remove the 2-pole connector from the Coolant temperature sensor - G62- -arrow-
- Install the Digital potentiometer (included in VAG 1594C) - VAG 1630- to contacts 1+2 of the connector of the coolant liquid temperature sensor - G62- and regulate the turned-on side to 15 kΩ.
- Remove the feed hose in the fuel distributor -1- and install it over the hose -2- of the oil separator.
- Remove the harness of the injection valves -3- from the bearings of the fuel distributor.
- Remove fastening screws of the fuel distributor -4-.
- Disconnect the connectors of the ignition coils-5-.



### 2.1.4 Tightness - check

### 2.1.5 Check conditions

- Fuel distributor removed from cylinder head.
- Hold a container below the injection valves with removed connectors.
- Ask another person to actuate the starter.

Fuel loss must not exceed 2 drops a minute.

If fuel loss is greater





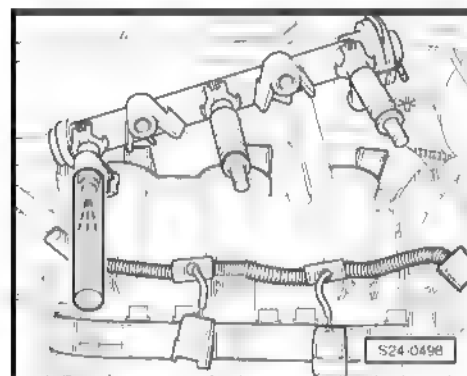
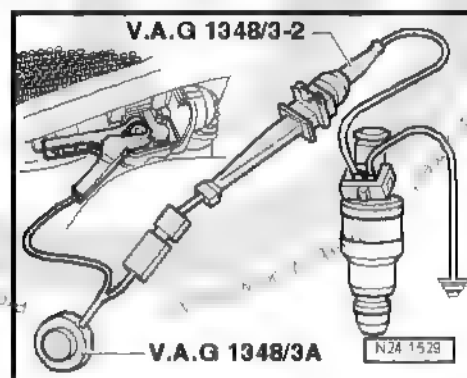
- Turn the ignition off.
- Replace the damaged injection valve → [page 104](#).

The installation of the injection valves is done in the reverse order. Pay attention to the following.

- Sealing rings on all injection valves must be replaced and quickly lubricated with clean engine oil.
- Install the fuel distributor with locked injection valves in the intake manifold and fasten it uniformly.

### 2.1.6 Injection valves flow check

- Connect one contact of the injection valve, to be checked, to the ground of the engine with a Set of measurement auxiliary cables - VAG 1594C-.
- Connect the other injection valve contact to the Remote Control - VAG 1348/3A- and the Adapter Cable - VAG 1348/3-2- to the positive terminal of the Battery - A+.
- Turn on the ignition; the Fuel pump (pre-supply pump) - G6- should work.
- Remove three graduated glasses from the Flow comparison tester - VAG 1602-.
- Remove the fuel distributor from the intake collector.
- Put the injection valve to be check in a graduated glass.
- Remove the connectors from the injection valves that will not be tested.
- Activate the Remote control - VAG 1348/3A- for 30 seconds.
- Repeat the verification in the remaining injection valves.



#### Note

*Use a graduated glass for each injection valve.*

- After all injection valves have been tested, put the graduated glasses on a flat surface and compare the injection flow.

Nominal value: 85...91 ml per injector.

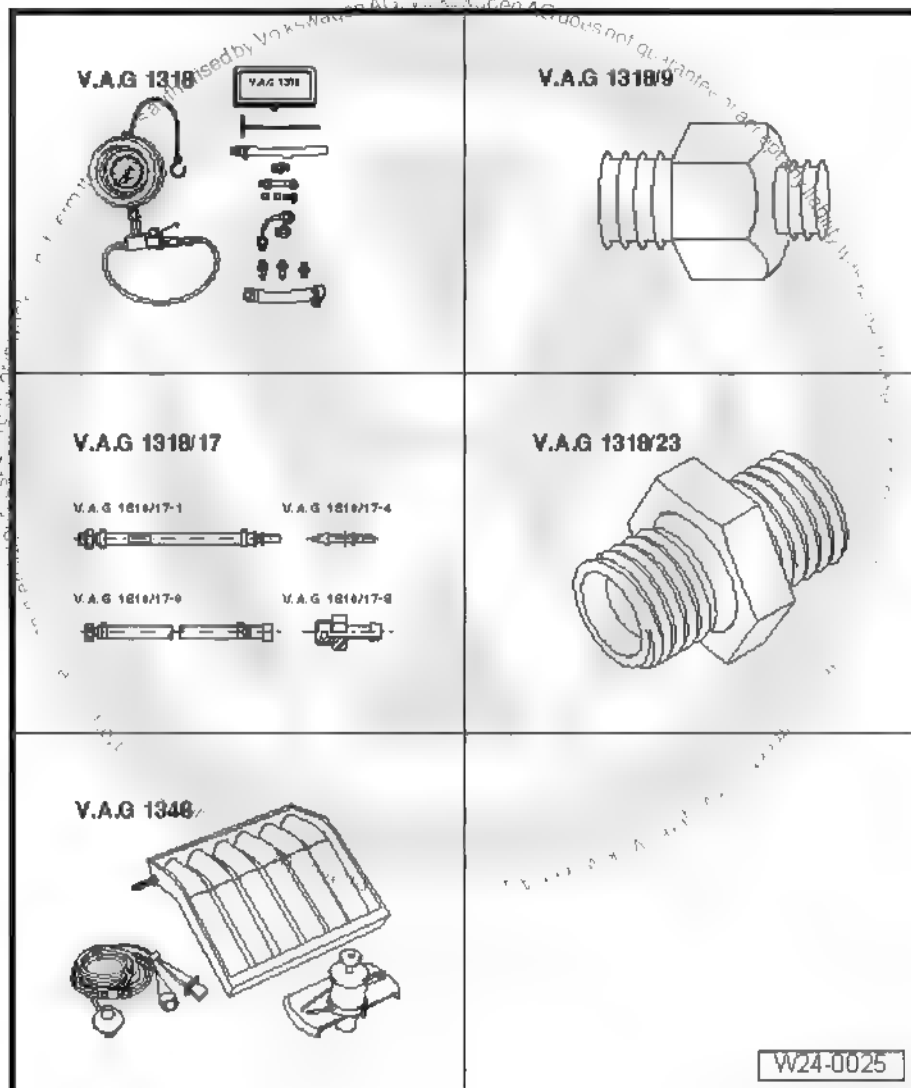
If the measured values of one or more injection valves are above or below the nominal value:

- Replace the damaged injection valve.

### 2.2 Residual pressure and fuel pressure regulator - check



Special tools and workshop  
equipment required



- ◆ Pressure gauge - VAG 1318-
- ◆ Adapter - VAG 1318/9-
- ◆ Adapting set - VAG 1318/17-
- ◆ Connector - VAG 1318/23-
- ◆ Remote control - VAG 1348A-
- ◆ Adapting cable - VAG 1348/3-2-

### 2.2.1 Pressure - check



#### Note

- ◆ *The fuel pressure regulator establishes the pressure at approx. 3.0 bar for vehicles manufacture until May/2006 and 4.0 bar for vehicles manufacture since June/2006.*
- ◆ *The fuel pressure regulator is in the Fuel pump (pre-supply pump) - G6-.*

### 2.2.2 Checking process

- Remove fuse holder cover



- Remove fuse 33 from the ( Fuel pump (pre-supply pump) - G6- ) fuse holder.

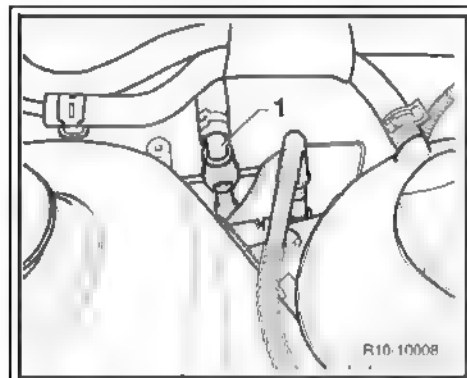
**WARNING**

*Fuel system is under pressure! Wear goggles and protection cover, so as to prevent serious injuries and contact with the skin. Before loosening the tube connections, wrap the connection points with cloth. Then eliminate the pressure, carefully pulling the flexible tube.*

- Disconnect the fuel supply hose connection -1- and clean the spilled fuel with a cloth.

**Note**

*To unblock the coupling of the fuel hose, press the safety key.*



- Install Pressure gauge - VAG 1318- with the Adapters - VAG 1318/9- and the Adapting set - VAG 1318/17- .
- Open the Pressure gauge valve - VAG 1318- . The key indicates the flow direction.
- Replace fuse 33 ( Fuel pump (pre-supply pump) - G6- ) on the fuse holder.
- Start engine and allow it to run in idle.
- Check the fuel pressure. Nominal value: 3.0 bar for vehicles manufacture until May/2006 and 4.0 bar for vehicles manufacture since June/2006.

**If the nominal value is not reached:**

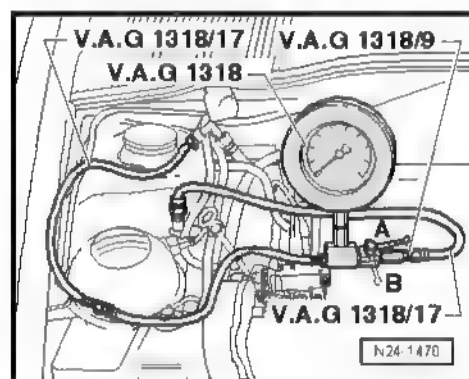
- Turn the ignition off.
- Check the Fuel pump (pre-supply pump) - G6- ⇒ [page 89](#) retention valve.

**If the nominal value is obtained:**

- Turn the ignition off.
- Check for leaks and residual pressure (in the whole system). For such, check pressure drop using the Pressure gauge - VAG 1318- . After 10 minutes there should still be a positive pressure of at least 2.0 bar.

**If residual pressure drops below 2 bar:**

- Start the engine and let it idle.





- Turn of the ignition, after the pressure is created. At the same time, the valve on the Pressure gauge - VAG 1318- has to be closed (valve handle in transverse to the flow direction - position -arrow-)

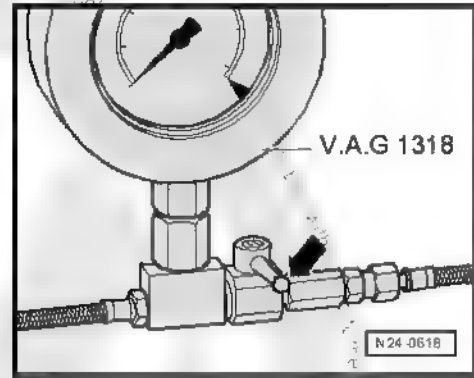
- Check the pressure drop on the Pressure gauge - VAG 1318- .

If the pressure continues dropping:

- Check the pipes of the Pressure Gauge - VAG 1318- to the Fuel pump (pre-supply pump) - G6- .
- Check Pressure gauge - VAG 1318- for leaks.

If the pressure stops dropping:

- Check the circlips between the fuel distributor and the injection valve, and the hose between the Pressure Gauge - VAG 1318- and the fuel distributor.



#### Note

*Before removing the Pressure gauge - VAG 1318- , once again place cloths around the hose connections.*

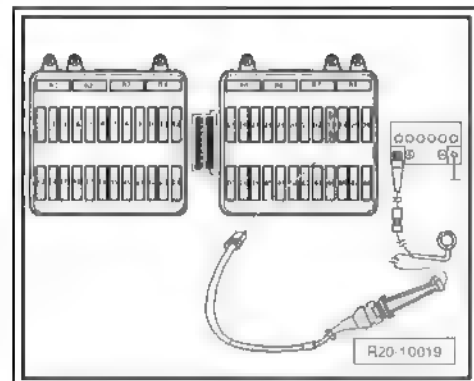
### 2.2.3 Fuel pressure regulator - check

- Retention valve for Fuel pump (pre-supply pump) - G6- OK, check ⇒ [page 89](#) .
- Turn the ignition off.
- Remove fuse holder cover.
- Remove fuse 33 from the ( Fuel pump (pre-supply pump) - G6- ) fuse holder.
- Connect the Remote control - VAG 1348/3A- and the Adapter cable - VAG 1348/3-2- to the bottom contact of the Fuel system pressurisation pump - G6- fuse 33 and to the positive (+) terminal of the Battery - A- .



#### WARNING

*Fuel system is under pressure! Wear goggles and protection cover, so as to prevent serious injuries and contact with the skin. Before loosening the tube connections, wrap the connection points with cloth. Then eliminate the pressure, carefully pulling the flexible tube.*



- Loosen fuel supply pipes -1- from fuel filter outlet.
- Return pipes -2- (blue), keep connected.
- Fuel filter -3- with the inlet hose.



- Fuel supply pipes (from filter outlet to engine) -4- connect to the measuring equipment outlet



#### Note

Press the keys on hose connectors.

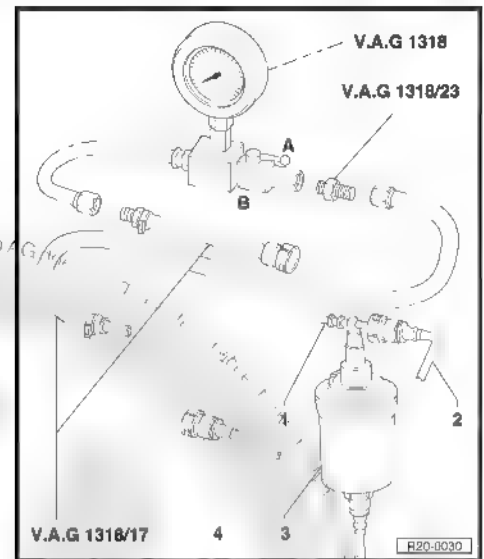
- Connect the Pressure gauge - VAG 1318- with Adapting set - VAG 1318/17- and Connector - VAG 1318/23- as shown
- Close the valve on the Pressure gauge - VAG 1318- (valve transverse to the flow direction in the -B- position) .
- Actuate the Remote control - VAG 1348/3A- for approximately 10 seconds to fill the fuel filter and generate the system pressure of approximately 3.0 bar for vehicles manufactured until May/2006 and 4.0 bar for vehicles manufacture since June/2006.
- Check pressure drop on the Pressure gauge - VAG 1318- . After 10 minutes, the pressure can not drop below 2.0 bar.

If the pressure drop more:

- Check the connections of the pipes for leaks.

If no irregularity is detected in the pipes:

- Replace fuel pressure regulator.





### 3 Engine control unit - J623-

Check the fault memory in the Engine control unit - J623-  
→ [page 116](#) and delete it.

Adapt the functions and the components → [page 117](#) .

#### 3.1 Engine control unit - J623- - remove and install

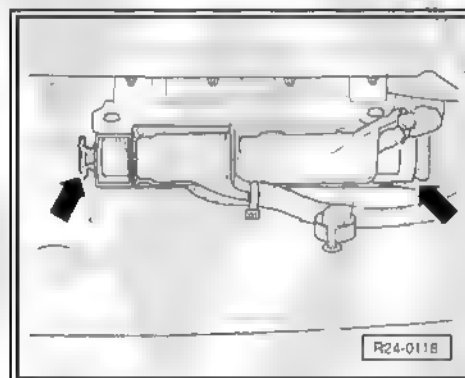
- Before removing it, see the identification and the coding  
→ [page 116](#) .
- Turn the ignition off.

##### Removal

- Remove the arms of the windscreen wiper and the lower cover of the windscreen ⇒ Electric equipment; Rep. gr. 92 ; Windscreen, rear window and headlight washer and wiper .
- Disconnect the fitting connectors -arrows- from the Engine control unit - J623- .
- Move the Engine control unit - J623- to the front part of the vehicle.

##### Installation

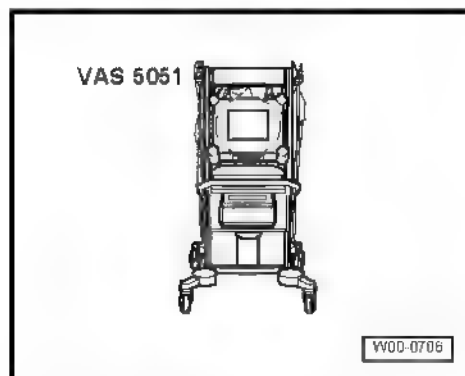
- Install the Engine control unit - J623- until blocking it.
- Install the fitting connectors for the Engine control unit - J623- .
- Install the arms of the windscreen wiper and the lower cover of the windscreen ⇒ Electric equipment; Rep. gr. 92 ; Windscreen, rear window and headlight washer and wiper .
- Adapt the Engine control unit - J623- → [page 117](#)
- Finally, access and erase, if required, the fault memory of the Engine control unit - J623- → [page 116](#) .
- Perform a test drive.
- Check the fault memory in the Engine control unit - J623- .



#### 3.2 Engine control unit - J623- - check and delete the fault memory

Special tools and workshop equipment required

- ◆ vehicle diagnostic and service information system - VAS 5051-

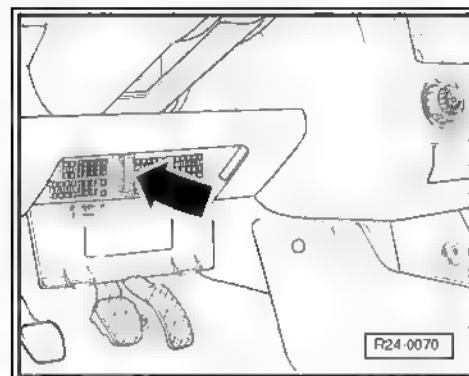


- ◆ Vehicle diagnostic and service information system - VAS 5052- ) with Cable - VAS 5051/1- or Cable - VAS 5051/3- .



#### Operation sequence

- Connect the Vehicle diagnostic, testing and information system as follows



- Connect to the diagnosis socket with Cable - VAS 5051/1- or Cable - VAS 5051/3-.

- Start the engine and keep it idling.

Only when engine does not start:

- Turn the ignition on.

Select the operational mode:

- Press the "Vehicle self-diagnosis" on the display.

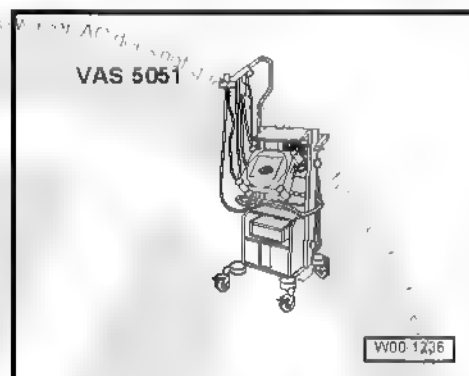
Select the vehicle system:

- Press on the display "01 - Electronic engine system".

In the display it is shown the Engine control unit - J623- identification and the code.

Select diagnosis function:

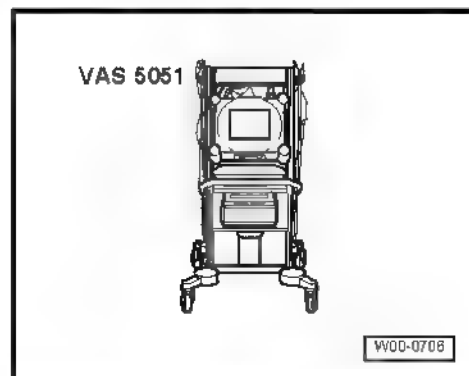
- Press on the display "02 - Check fault memory".
- If there are no faults in the Engine control unit - J623- , the display shows "0 faults found".
- If there are faults stored in the Engine control unit - J623- , those will be shown sequentially on the display.
- Press the key.
- Press on the display "05 - Erase fault memory".
- On the display press "06 - End test".



### 3.3 Functions and components - adapt

Special tools and workshop equipment required

- ◆ vehicle diagnostic and service information system - VAS 5051-

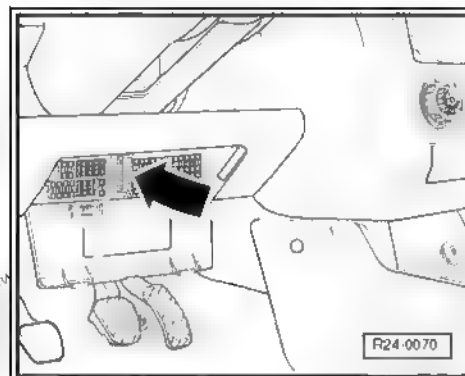


- ◆ Cable - VAS 5051/1- or Cable - VAS 5051/3-



### Operation sequence

- Connect the Diagnosis, Measurement and Information System -arrow-:

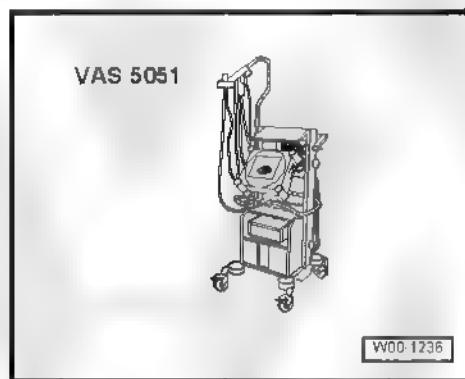


- Connect to the diagnosis socket with Cable - VAS 5051/1- or Cable - VAS 5051/3-.

Select, in the Diagnosis, Measurement and Information System the "Assisted troubleshooting search".

After all control units are consulted:

- Press the "Skip" key
- Select "Function/component selection"
- "Select activate"
- Select "Engine codes"
- Select "01 - Self-diagnosis systems"
- Select "Engine distribution"
- Select "Functions"
- Select "Function or component"







## 26 – Exhaust system

### 1 Exhaust system components

#### Note

- ◆ After assembly works, make sure the exhaust system is not tensioned and that there is a suitable distance from the body. If necessary, loosen the double and retaining clamps and align the muffler and exhaust pipe so that there is always a suitable distance between it and the body and that the supports have a uniform load.
- ◆ Always replace self-locking nuts.

Exhaust manifold, catalyst and front exhaust pipe with intermediate muffler and installation parts ⇒ [page 119](#).

Rear muffler with supports ⇒ [page 121](#).

#### 1.1 Exhaust system components - assembly overview

##### 1 - Heat shield

- ☐ Install without tension.

##### 2 - 10 Nm

##### 3 - Exhaust manifold

- ☐ For removal, remove heat deflector and loosen front pipe.

##### 4 - Lambda probe - G39-

- ☐ 50 Nm
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- the High-temperature paste - G 052 112 A3- must not penetrate the grooves on the body of the Lambda probe - G39-.
- ☐ Remove and install with the Wrench Sockets Set for Lambda probe - 3337-.
- ☐ In case of leakage, cut and replace the sealing ring.

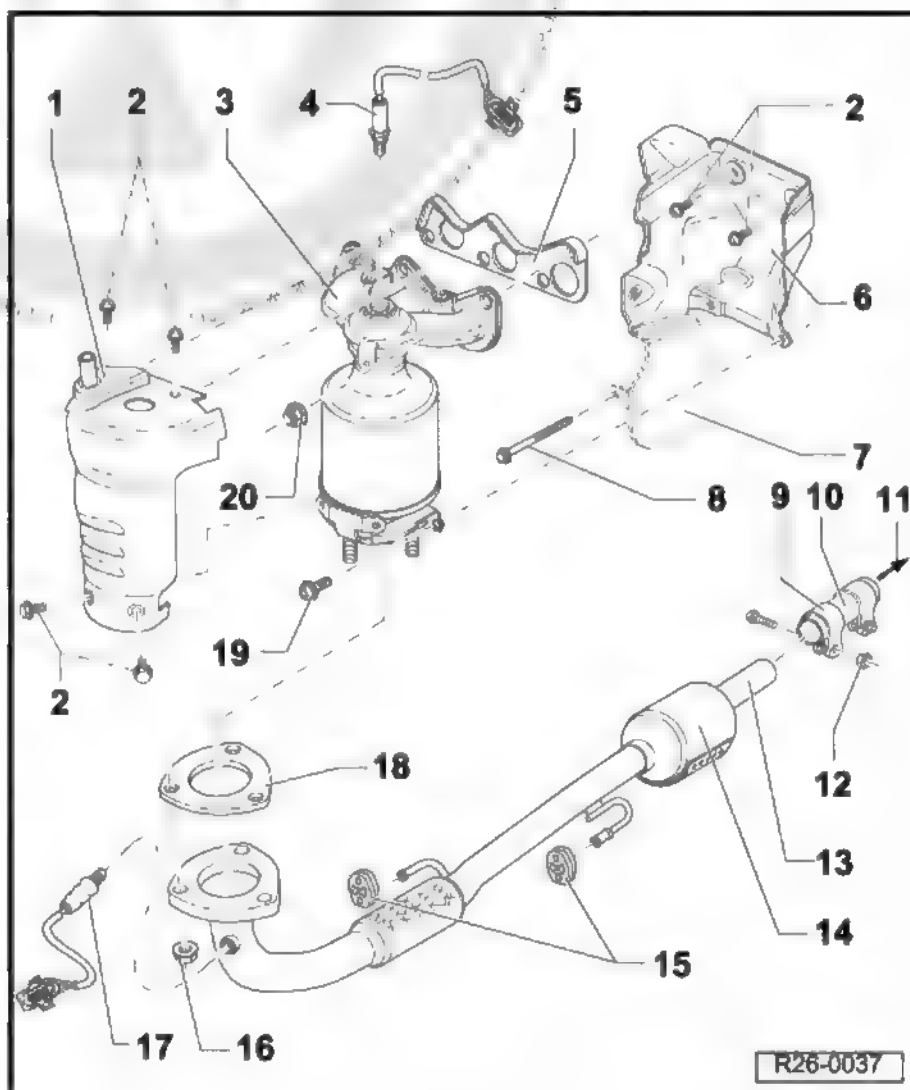
##### 5 - Gasket

- ☐ Renew after each removal.

##### 6 - Heat shield

##### 7 - Heat shield

- ☐ Of the Alternator - C-.





8 - 20 Nm

9 - Double clamp

10 - Tube

11 - To rear muffler

12 - 25 Nm

13 - Front tube with intermediate muffler

14 - Intermediate muffler

15 - Sustaining handle

- ☐ Replace if damaged

16 - 40 Nm

- ☐ Renew after each removal.

17 - From Lambda probe after catalyser - G130-

- ☐ 50 Nm
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- the High-temperature paste - G 052 112 A3- must not penetrate the grooves on the body of the Lambda probe after catalyzer - G130- .
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ In case of leakage, cut and replace the sealing ring.

18 - Gasket

- ☐ Renew after each removal.

19 - 10 Nm

20 - 25 Nm

- ☐ Renew after each removal.





## 1.2 Rear muffler with supports - assembly overview

1 - Rear exhaust pipe with muffler

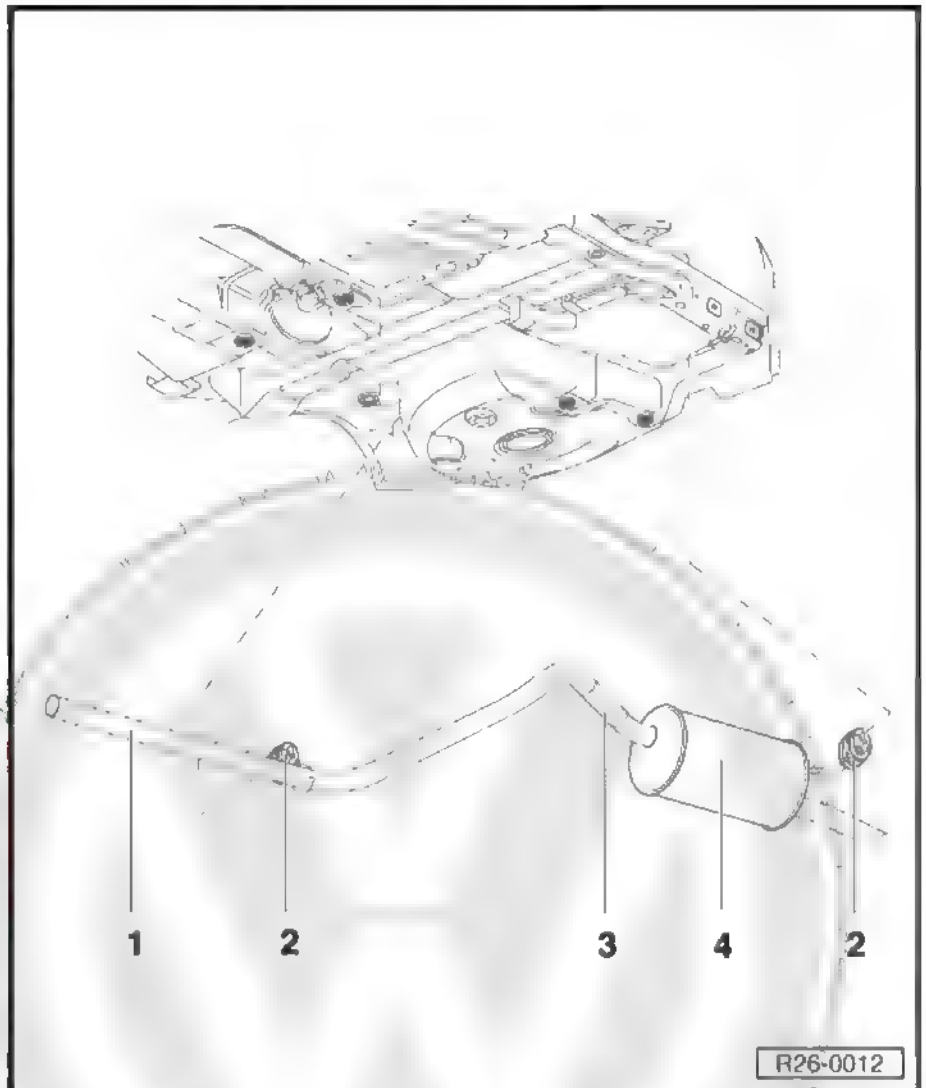
2 - Sustaining handle

- ☐ Replace when damaged.
- ☐ Remove with a Hook - VW 5812-.

3 - Separation point

- ☐ Identified by a re-entry on the connecting pipe.
- ☐ As standard items, the rear muffler with exhaust tube as one part are mounted. For repair, the rear muffler is supplied individually with one double clamp.
- ☐ Cut the connecting pipe at the separation point with Pneumatic Saw - EQ 7415- or Pneumatic Saw - VAG 1523A- or with the Pipe cutter - VAS 6254- => [page 121](#)

4 - Rear muffler



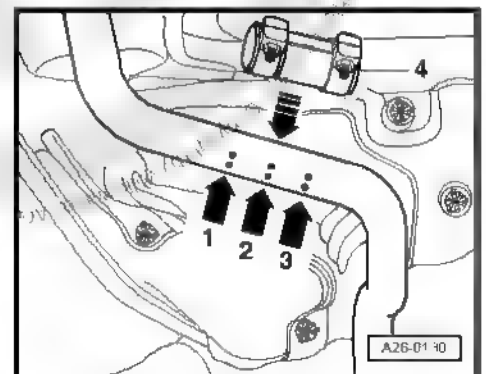
Separation point on the exhaust tube



### WARNING

*Wear protection goggles and clothing to prevent from injuries caused by metallic filings.*

- Cut exhaust tube in right angle on the -arrow 2-separation point.
- At installation, place double clamp for repair -4- during installation, on lateral identifications -arrows 1 and 3-. Tightening torque 25 Nm.





## 28 – Ignition system

### 1 Ignition system

#### General instructions regarding the ignition system

- ◆ The Engine control unit - J623- is equipped with a self-diagnosis system.
- ◆ A minimum voltage of 11.5V is necessary for the correct operation of electrical components.
- ◆ In certain verification it is possible that the Engine control unit - J623- identifies a fault and records it in the memory. Due to that, after all verification and repair works are concluded, check the fault memory and delete it, if necessary.

Ignition system components - remove and install ➔ [page 122](#) .

Ignition coils with the final power stages - remove and install ➔ [page 123](#) .

Safety measures ➔ [page 124](#) .

Test data, Spark plugs - Q- ➔ [page 125](#) .

#### 1.1 Ignition system components - assembly overview

##### 1 - Ignition coil 1 with final power stage - N70-

- ❑ Ignition coil 2 with final power stage - N127-
- ❑ Ignition coil 3 with final power stage - N291-
- ❑ Remove and install with Puller - T 10094- ➔ [page 123](#) .

##### 2 - Ignition coil connector

- ❑ Black, 4 poles.

##### 3 - Connector of the Knock control 1 - G61-

- ❑ Black, 2 poles.
- ❑ Connector contacts, golden.

##### 4 - 20 Nm

- ❑ The tightening torque influences the operation of the Knock Sensor 1 - G61- .

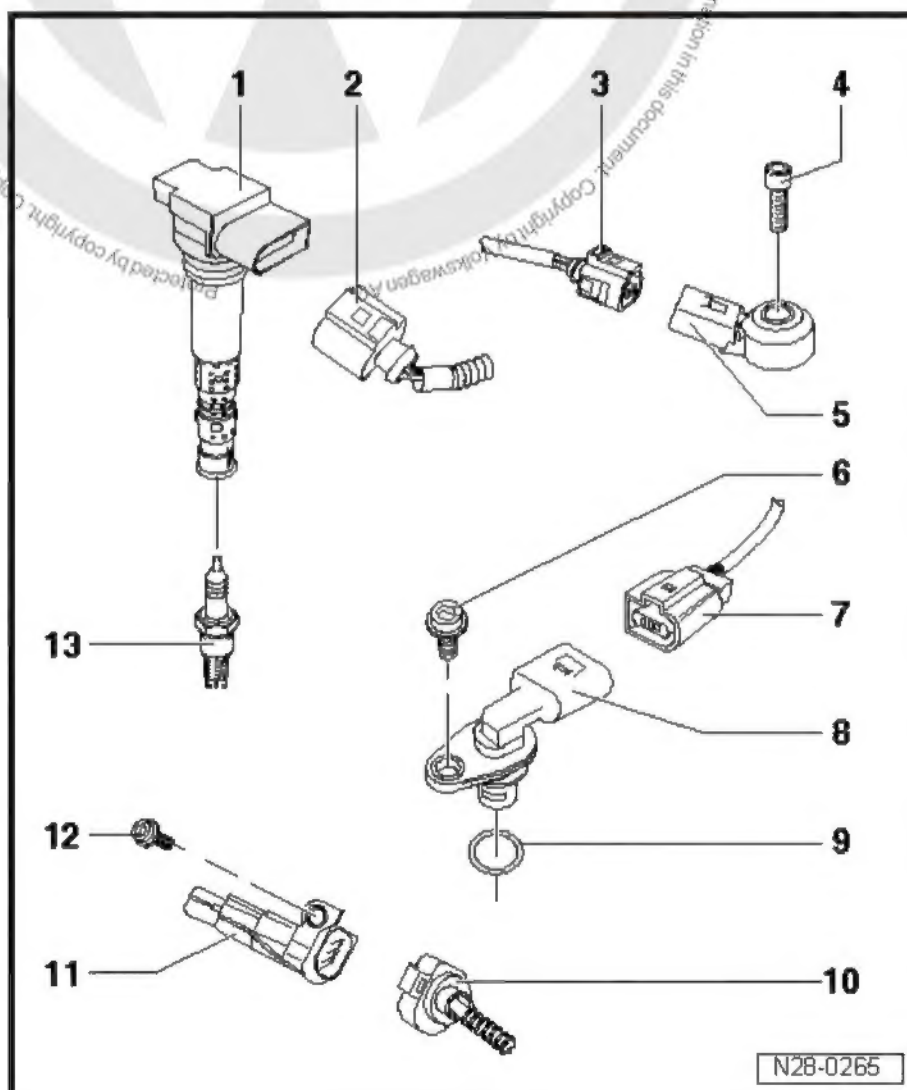
##### 5 - Knock sensor 1 - G61-

- ❑ Connector contacts, golden.

##### 6 - 10 Nm

##### 7 - Connector

- ❑ Black, 3 poles.
- ❑ From Hall Sensor - G40- .



N28-0265



8 - Hall Sender - G40-

9 - Seal

- ☐ Replace if damaged.

10 - Connector

- ☐ Black, 3 poles.
- ☐ From Oil level and temperature sensor - G266- .
- ☐ Not applicable.

11 - Oil level and temperature sensor - G266-

- ☐ Not applicable.

12 - 8 Nm

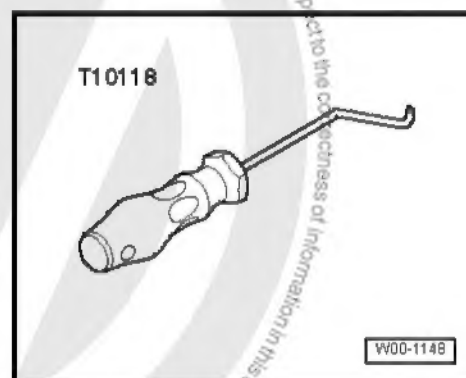
13 - Spark plug

- ☐ 30 Nm
- ☐ Remove and install with Spark plug wrench - 3122 B- .
- ☐ Type and inter-electrode gap ➔ [page 125](#) .

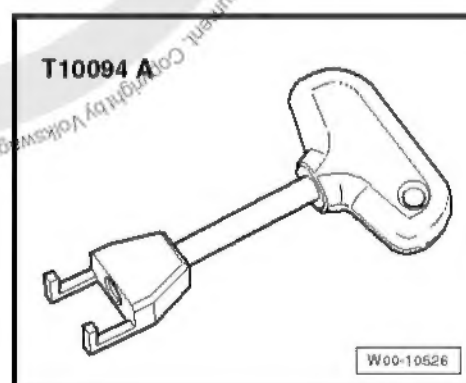
## 1.2 Ignition coils with the final power stages - remove and install

Special tools and workshop equipment required

- ◆ Hook - T10118-



- ◆ Puller - T10094A-



### Note

*The housing of ignition coils with final power stages has been modified. Therefore, ignition coils may only be installed and removed with the Extractor - T10094 A- . The Extractor - T10094- may also be used as long as it is refinished, as per the following information.*





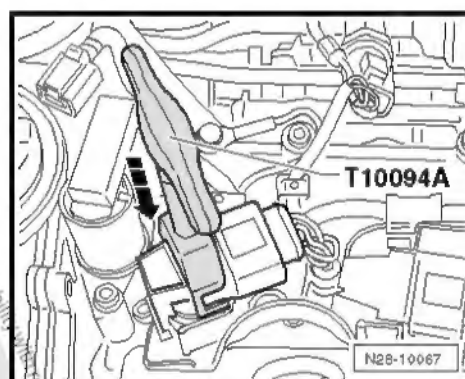
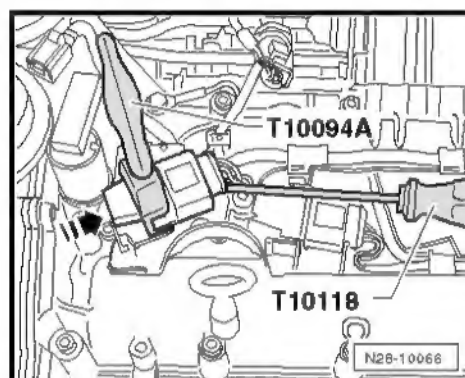
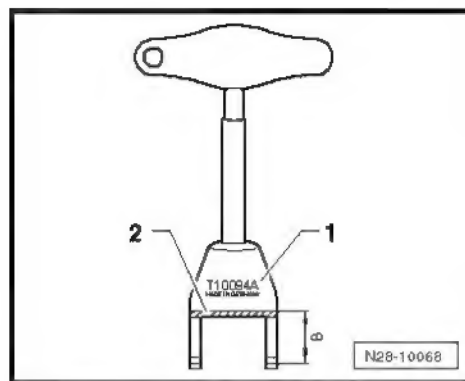
- Refinish the marked area -2- with proper workshop methods, until reaching the measurement of 18 mm -B-.
- Identify the modified tool with the letter A -1-.

#### Removal

- Install the Extractor - T10094A- on top of the ignition coil with final power stage -arrow-.
- Install the Hook - T10118- as illustrated.
- Unlock the connector block carefully and remove the connector.
- Remove the ignition coil with the final power stage.

#### Installation

- Install the Extractor - T10094A- on top of the ignition coil with final power stage.
- Install the ignition coil with final power stage in the -arrow- direction on the engine cylinder head.
- Connect the connector to the ignition coil with final power stage until fitting it audibly.



### 1.3 Safety measures

To prevent personal injuries an/or the destruction of the injection and ignition system, the following must be taken into account:

- ◆ Do not touch the ignition cables or turn them off with the engine running or at start.
- ◆ Only connect or disconnect the injection and ignition system cables, including measuring device cables, with the ignition switched off.

If during a test drive it is necessary to use test and measuring equipment, observe the following:

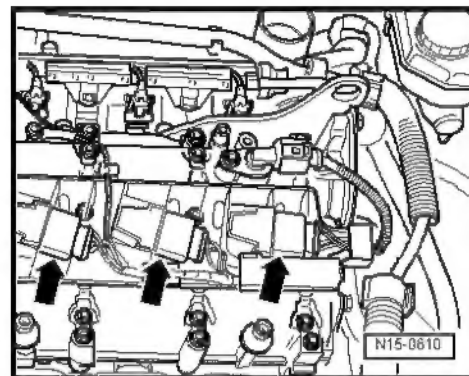
- ◆ The measuring and test equipment must always be fastened to the back seat and operated from there by another mechanic.

If the measuring and test equipment are operated from the front passenger seat, the person sitting there might be hurt due to the activation of the passenger airbag in case of accident.

- ◆ In case there is the intention of turning the engine with the starter, without operating the engine:



- Turn off all 4-pole connectors -arrows- from the ignition coils.

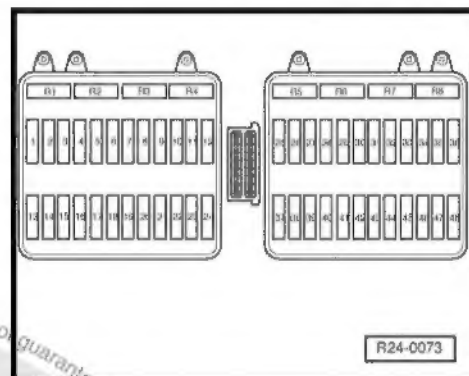


- Remove fuse 33 from the fuse holder. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



#### Note

Through the removal of fuse 44 the tension feed to the injection valves is interrupted.



## 1.4 Test data Spark plugs - Q-

Engine codes	BMD/CHFB/CHFA	BMD/CHFB/CHFA	BMD/CHFB/CHFA
Ignition sequence	1-2-3	1-2-3	1-2-3
Spark plugs <sup>15) 14)</sup>	BOSCH	NGK	BOSCH
VW/Audi	101 905 601 B	101 905 617	101 905 601 F
Manufacturer's reference	F 7 HER2	ZFR5P-G	----
Distance between the electrodes	0.8...0.9 mm	0.8...0.9 mm	1.0...1.1
Tightening torque	30 Nm	30 Nm	30 Nm

14) Current values and replacement intervals of the Spark plugs - Q- : ⇒ Exhaust gas Test Folder.

15) Remove and install the Spark plugs - Q- using Spark plug socket - 3122B- .